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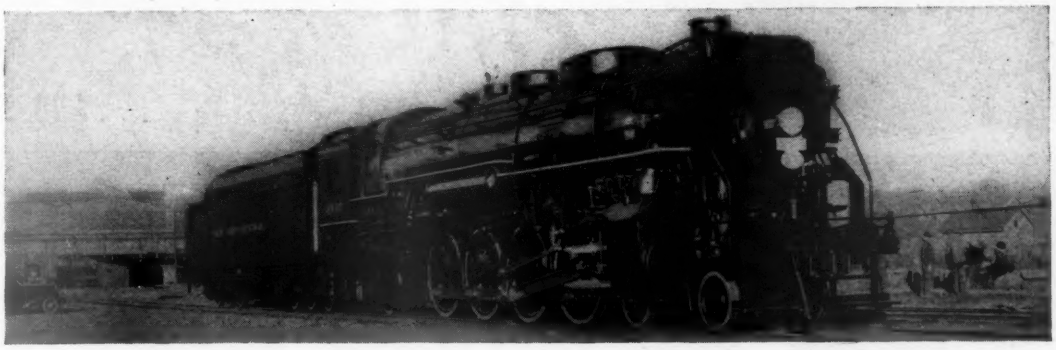

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New York Central Buys 50

4-8-2 Type Locomotives

Half of this group of freight locomotives are completely fitted for main-line passenger service—Lightweight parts and improved balancing are important features

THE New York Central is now placing in service, as delivered, 50 locomotives of the 4-8-2 type. Twenty-five of these units are completely equipped for passenger and freight service while the remainder are fitted for freight service only. The passenger and freight locomotives are known as the railroad Class L-3a and were built by the American Locomotive Company. The freight locomotives are known as the L-3b Class and 10 of these were built by the same builder, while the remaining 15 freight locomotives were built by the Lima Locomotive Works.

Some time ago two L-2 Class locomotives were converted for high-speed service by the application of lightweight revolving and reciprocating parts and improved cross-balancing. These two locomotives were tested extensively to determine the comparative effect on track with 69-in. drivers of these locomotives and the 79-in. drivers of passenger locomotives at speeds from 60 to 85 m. p. h. The results indicated a performance for the converted locomotives equal to that of the locomotives designed specifically for passenger service. The principal features of the converted power have now been incorporated in the new L-3 Class locomotives.

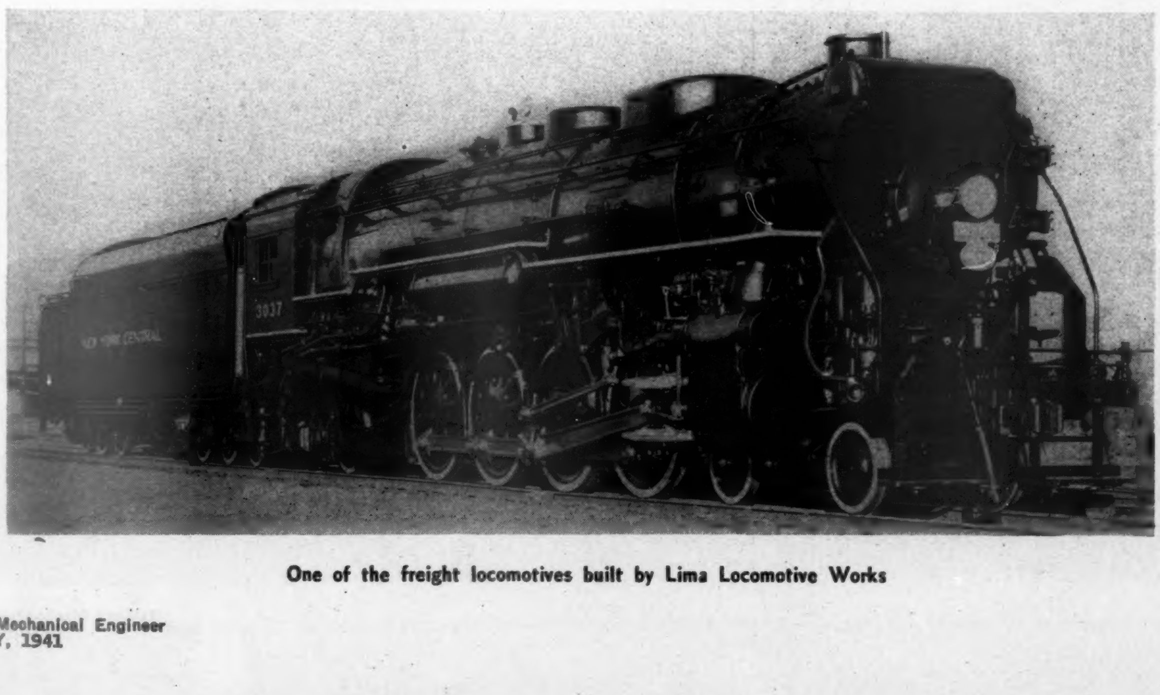
The new power is fitted with unusually large tenders having 43 tons fuel capacity and water capacity, because of the use of water scoops, is limited to 15,500 gal.

The Boiler

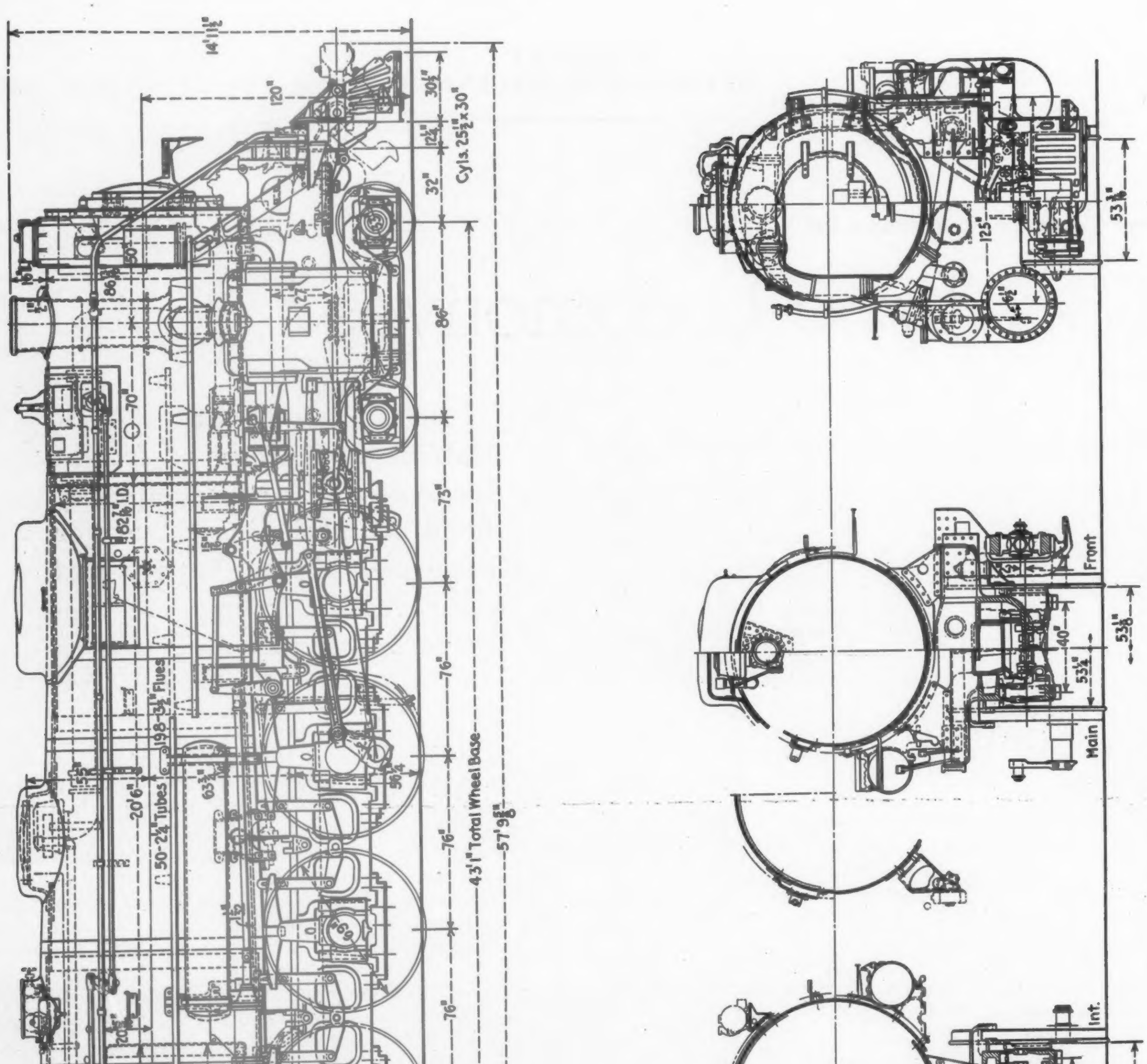
The boiler of the Class L-3 locomotives is of the conical type 82$\frac{7}{16}$ in. inside diameter at the first course and 94 in. outside diameter at the largest course. The boilers are designed for a working pressure of 255 lb. and the three 3½-in. safety valves are set to release at 250, 252, and 254 lb. The boiler is supported on the bed by waist sheets at the guide yoke and between each two pairs of drivers. Expansion shoes are used at the front and rear of the firebox. All boiler sheets are carbon steel and all rivets of soft steel. The principal boiler dimensions and proportions are shown in an accompanying table.

Welding is employed on all inside firebox seams. The flues are welded into the back flue sheet after final shop test. Seal welding of seams was used on the outside firebox at all four mud ring corners and the ends of the barrel-course longitudinal seams are butt-welded for 12 in. from the ends of the courses. In the throat sheet and inside back firebox sheets the five openings for the five 3-in. arch tubes are built up, by welding, from sheet thickness to ¾ in., and 4½ in. diameter to provide for greater tube bearing in the sheets.

The firebox ring is cast steel, machined at all sheet and crosstie fits.



One of the freight locomotives built by Lima Locomotive Works



Erecting elevation and cross sections of the New York Central L-3a locomotive

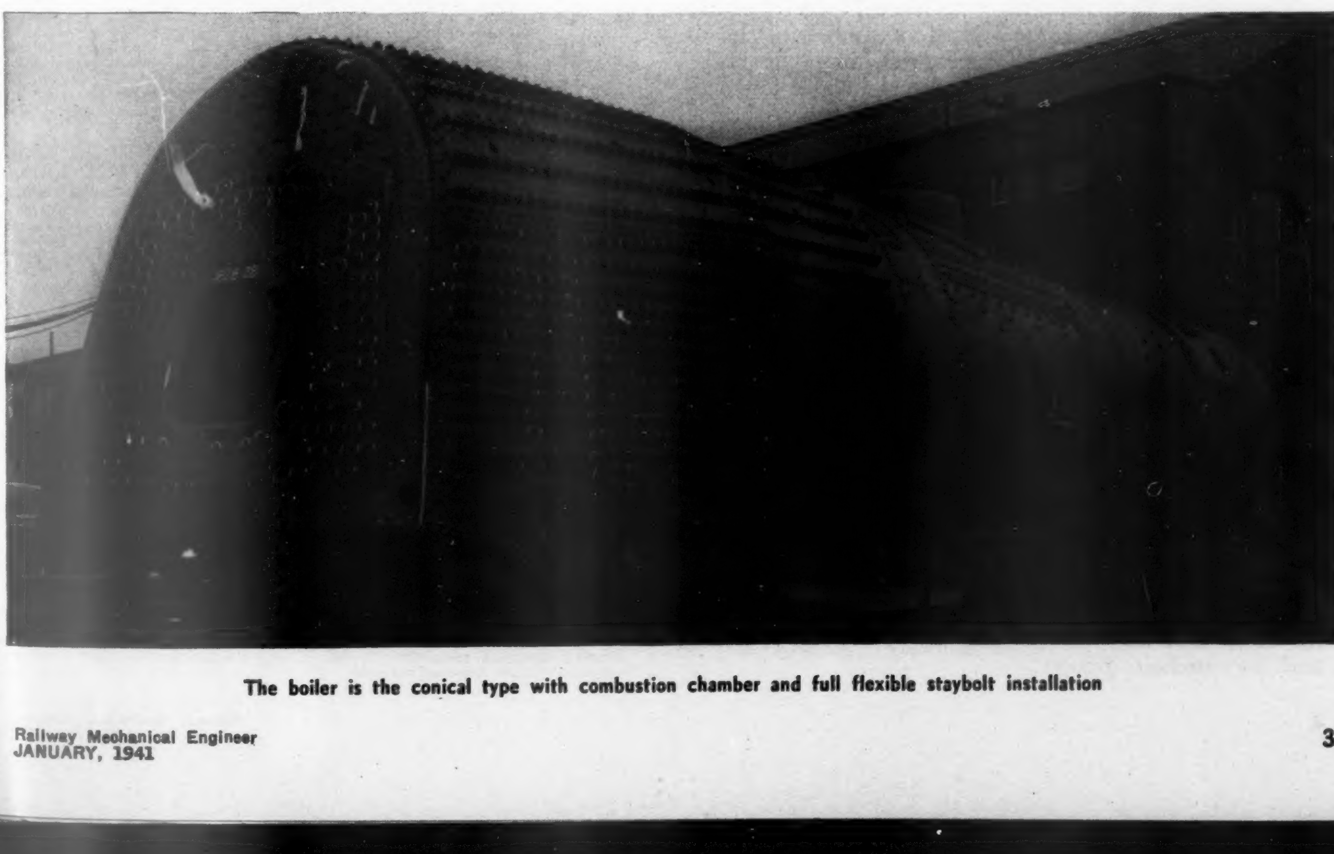
Locomotive No. 3006—one of those equipped for passenger service—at the Schenectady plant of the American Locomotive Company

All flexible firebox staybolts are the Flannery D Type head, hollow-drilled bolts. The crown stays, using UW sleeves and A caps, are in seven rows on each side of the shell starting with the fourth row from the top center line and running the full length of the firebox and combustion chamber back of three front rows of expansion stays. These expansion stays are in 10 rows each side of the top center line. There is a complete installation of flexible water space stays in the combustion chamber, throat, sides and back head except for one row above the mud ring. Where flush-type flexible are required, the FW sleeves with A caps are used.

Rigid crown stays are used in the three rows on each side of the top center line for the full length of the firebox and combustion chamber, back of the three front rows of expansion stays.

The bituminous coal is fed by a Standard HT stoker and burned on Firebar grates. The brick arch is supported on five 3-in. tubes. Water is supplied to the boilers by Nathan, Type 1918 B non-lifting injectors on the right side and feedwater heaters on the left. Worthington 5½ SA heaters are applied to the 35 Alco-built locomotives and the 15 built by Lima are equipped with Elesco K5OL heaters.

The boilers have Type E, 100-unit, single-loop, superheaters with American throttles integral with the headers. The steam pipes have an inside diameter of 8½ in. Steam dryers are used in the dome on both the 9⅜-in. main dry pipe and on the dry pipe leading to the main turret. The latter is located in the roof sheet outside the cab and the valve controls are conveniently arranged, and marked, on a panel over the back head near the cab roof. All auxiliaries, except blowers, operate on saturated steam from this turret. The blowers are supplied



The boiler is the conical type with combustion chamber and full flexible staybolt installation

Principal Dimensions, Weights and Proportions of the New York Central 4-8-2 Type Locomotives

Class	L-3a	L-3b	
Builder	Alco (25)	Alco (10)	Lima (15)
Road numbers	3000-3024	3025-3034	3035-3049
Date built	Nov.-Dec., 1940	Dec., 1940	
Service	Pass. and frt.	Freight	
Dimensions:			
Height to top of stack, ft.-in.	14—11½	14—11½	
Height to center of boiler, ft.-in.	10—0	10—0	
Width overall, ft.-in.	11—⅞	11—⅞	
Cylinder centers, in.	91	91	
Weights in working order, lb.:			
On drivers	262,000	*	265,000
On front truck	70,400	*	65,100
On trailing truck	56,100	*	63,400
Total engine	388,500	*	393,500
Tender (two-thirds loaded)	302,240	*	303,990
Wheel bases, ft.-in.:			
Driving	19—0	19—0	
Engine, total	43—1	43—1	
Engine and tender, total	95—11½	95—11½	
Wheels, diameter outside tires, in.:			
Driving	69		69
Front truck	33		33
Trailing truck	44		44
Engine:			
Cylinder, number, diameter and stroke, in.	25½ x 30		25½ x 30
Valve gear, type	Baker		Baker
Valves, piston type, size, in.	14		14
Maximum travel, in.	8½		8½
Steam lap, in.	1⅝		1⅝
Exhaust clearance, in.	3/16		3/16
Lead, in.	5/16		5/16
Cut-off in full gear, per cent	82		82
Boiler:			
Type	Conical		Conical
Steam pressure, lb. per sq. in.	250		250
Diameter, first ring, inside, in.	82⅞		82⅞
Diameter, largest outside, in.	94		94
Firebox, length, in.	120⅛		120⅛
Firebox, width, in.	90¼		90¼
Height mud ring to crown sheet, back, in.	69		69
Height mud ring to crown sheet, front, in.	89 13/16		89 13/16
Combustion chamber length, in.	63		63
Arch tubes, number and diameter, in.	5—3		5—3
Tubes, number and diameter, in.	50—2¼		50—2¼
Flues, number and diameter, in.	198—3½		198—3½
Length over tube sheets, ft.-in.	20—6		20—6
Fuel	Bituminous		Bituminous

	L-3a	L-3b	
Grate area, sq. ft.	75.3		75.3
Heating surfaces, sq. ft.			
Firebox and comb. chamber	338		338
Arch tubes	35		35
Firebox, total	373		373
Tubes and flues	4,284		4,284
Evaporative, total	4,657		4,657
Superheating	2,080		2,080
Comb. evap. and superheat	6,737		6.737
Tender:			
Type	Rectangular		Rectangular
Water capacity, gal.	15,500		15,500
Fuel capacity, tons	43		43
Trucks	Six-wheel		Six-wheel
General data, estimated:			
Rated tractive force, engine, 85 per cent, lb.	60,100		60,100
Rated tractive force, booster, lb.	......		14,000
Total rated tractive force, lb.	......		74,100
Weight proportions:			
Weight on drivers ÷ weight engine, per cent	67.4	*	67.4
Weight on drivers ÷ tractive force	4.36	*	4.41
Weight of engine ÷ evap. heat. surface	83.5	*	84.5
Weight of engine ÷ comb. heat. surface	57.7	*	58.4
Boiler proportions:			
Firebox heat. surface per cent comb. heat. surface	5.54	5.54	
Tube-flue heat. surface, per cent comb. heat. surface	63.6	63.6	
Superheat. surface, per cent comb. heat. surface	30.9	30.9	
Firebox heat. surface ÷ grate area	4.96	4.96	
Tube-flue heat. surface ÷ grate area	56.9	56.9	
Superheat. surface ÷ grate area	27.6	27.6	
Comb. heat. surface ÷ grate area	89.5	89.5	
Evaporative heat. surface ÷ grate area	62.0	62.0	
Tractive force ÷ grate area	789.0	789.0	
Tractive force ÷ evap. heat. surface	12.9	12.9	
Tractive force ÷ comb. heat. surface	8.93	8.93	
Tractive force × diameter drivers ÷ comb. heat. surface	615.4	615.4	

*Weights of Alco L-3b locomotives not available.

with superheated steam from an auxiliary turret near the front end the blower valves in lines from this turret are controlled from the cab.

Other boiler accessories are shown in the accompanying list of equipment and materials.

Engine Bed, Wheels and Bearings

The engine bed, supplied by General Steel Castings Corporation embraces the cylinders and back heads, guide yoke and valve-motion supports, air-pump brackets and frame cross-members. The right and left main bed members are on 40-in. centers. The beds are all arranged for roller or friction-bearing application and have the wheel centers so spaced as to permit the installation of 72-in. drivers, if desired. Should this be done, the height of the locomotive will be increased 1½ in.

The spring rigging is the conventional equalizer and elliptic spring design with reverse camber driving springs. The hangers, links and intermediate equalizers are mild steel while the trailer truck and transverse equalizers are normalized carbon vanadium. The springs are carbon steel, with cast-steel saddles.

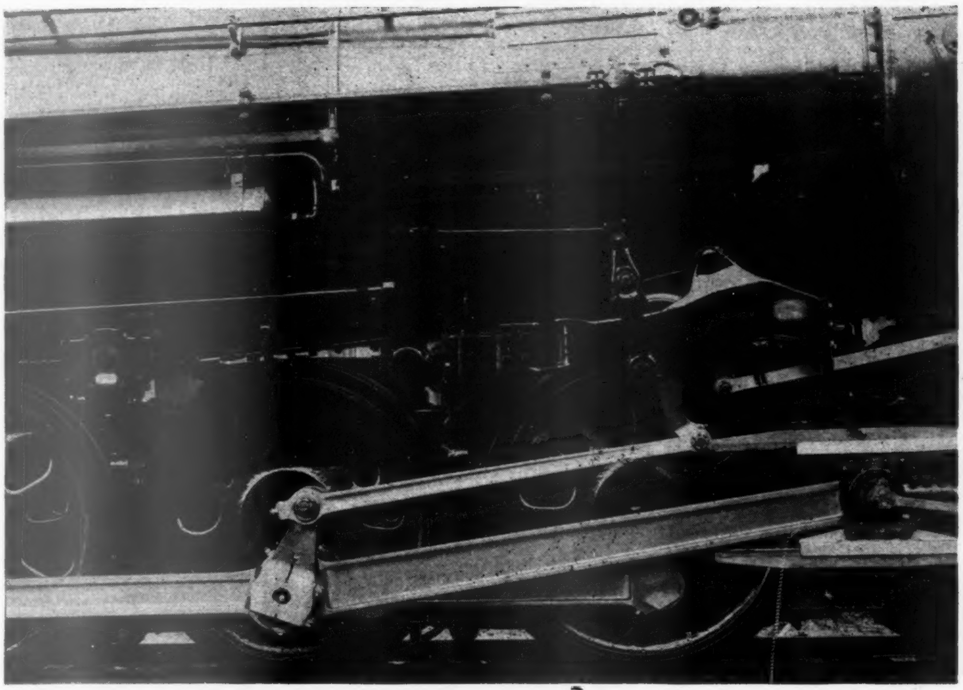
The driving wheels are the Boxpok type on 40 locomotives and the web-spoke type on the other 10. All four pairs of drivers are cross balanced. The overbalance at Nos. 1 and 4 wheels is 115 lb., 166 lb. at the No. 2, or main wheel, and 132 lb. at the No. 3 wheel. The dynamic augment at diametral speed is 7,950 lb. at the main wheel, 6,350 lb. at the No. 3 wheel, and 5,500 at the Nos. 1 and 4 wheels. This compares with the dynamic augment of the L-2d class of 13,900 lb. on the front and back wheels and 15,400 lb. on the main and intermediate drivers.

Twenty-five locomotives are equipped with carbon-vanadium driving axles and Timken roller bearings while the other 25 have medium carbon-steel axles and crown bearings. All driving axles are hollow bored, 4 in. diameter. The journal sizes on the roller-bearing axles

Comparison of Characteristics of New York Central 4-8-2 Locomotives

	L-2d Freight	L-2d converted 2998	L-3a Freight and Passenger	L-3a Freight
Builder	Alco	Alco	(25) Alco	(10) Alco (15) Lima
Road numbers	2925-2997; 2999	2998	3000-3024	3025-3034 3035-3049
Date built	Nov. 1929	Nov. 1929	Dec. 1940	
Service	Freight	Passenger and freight	Passenger and freight	Freight
Weight on drivers in working order, lb.	250,000	257,000	262,000	265,000
Total engine weight, in working order, lb.	370,150	385,100	388,500	393,500
Weight of tender, in working order, lb.	313,500	313,500	373,900	
Cylinders, diameter and stroke, in.	27 x 30	25½ x 30	25½ x 30	
Driving wheels, diam., in.	69	69	69	
Steam pressure, lb.	225	250	250	
Fuel	Bit. coal	Bit. coal	Bit. coal	
Grate area, sq. ft.	75.3	75.3	75.3	
Firebox heating surface, total, sq. ft.	354	354	373	
Evaporative heating surface, sq. ft.	4,556	4,556	4,657	
Superheating surface, sq. ft.	1,931	1,931	2,080	
Tractive force, engine. lb.	60,620	60,100	60,100	
Tractive force with booster	73,020	73,850	...	74,100*
Dynamic augment on main driver at diametral speed, lb.	15,400	7,950	7,950	

*Booster on freight locomotives only.



The valve motion and running gear — The side and main rods are manganese vanadium steel and the crosshead, piston and piston rod are Timken lightweight design

are $12\frac{9}{16}$ in. for the main and $11\frac{5}{8}$ in. for the others. On the plain-bearing axles, the journals are $12\frac{1}{2}$ in. by

Lubrication—New York Central 4-8-2 Type Locomotives

	L-3a	L-3b	
	Alco (3000-3024)	Alco (3025-3034)	Lima (3035-3049)
Right-side lubricator-valve oil	Nathan DV-5, 26 pts. 7 feeds	Detroit Mod. B, 32 pts. 7 feeds	Detroit Mod. B, 32 pts. 6 feeds
No. of feeds:			
Cylinder and valves	4	4	4
Air pump	1	1	1
Stoker	1	1	1
Feedwater pump	1	1	None
Guides	None	None	None
Left-side lubricator-engine oil	Nathan DV-5, 26 pts., 10 feeds	Detroit Mod. B. 32 pts., 14 feeds	
No. of feeds and points lubricated:			
Engine-truck-wheel pedestals	2—8	2—8	
Valve-stem guides	1—4	1—4	
Main guides	1—2	1—2	
Driving-box hub face	None	2—8	
Driving-box pedestals	4—16	4—16	
Driving-box wedges	None	2—8	
Trailer-truck pedestals	1—4	1—4	
Trailer-truck center pin and radial buffer	1—3	1—3	
Total no. of feeds and points lubricated	10—37	14—53	
Engine-truck center plate	Oil cup	Oil cup	
Alemite hard grease fittings:			
Main and side rods	No. G-575		
Electrical rod, back end	No. G-575		
Main crank pin	No. 1267		
Alemite soft-grease fitting No. 1396:			
Valve gear, except valve-stem guides	With		
Valve-stem guides	None		
Reverse gear	With		
Reverse shaft bearings and arms	With		
Radial buffer	None		
Throttle-rod bearings	With		
Speed recorder	With		
Waterscoop piston-rod guide	With		
Waterscoop shaft bearings	With		
Trailer spring hanger pin	With		
Reach-rod guide, reverse gear	With		
Feedwater pump (Elesco)	None		
Lateral-motion device	With—Class L-3a only		
Side-rod knuckle pins	With		
Tender brake slack adjuster pull rod	With		
Rex valve-oil fitting No. 15: Crosshead roller-bearing wrist pin	With		
Tender-truck roller-bearing pedestals	With		
Throttle cam-shaft packing	Valve oil with separate oil cup		
Tender-truck center plate	Oil cup		

14 in. and 11 in. by 13 in., respectively. Magnus bearings and hub plates, and Franklin adjustable wedges and snubbers are used on these locomotives. The Alco lateral cushioning device is used on Nos. 1 and 2 wheels. Provision is made for future application on the intermediate or back wheels. The resistances at the front and main wheels, where this device is used, are 17 and 8 per cent, respectively. The lateral is $\frac{1}{2}$ in. and $\frac{5}{16}$ in., respectively.

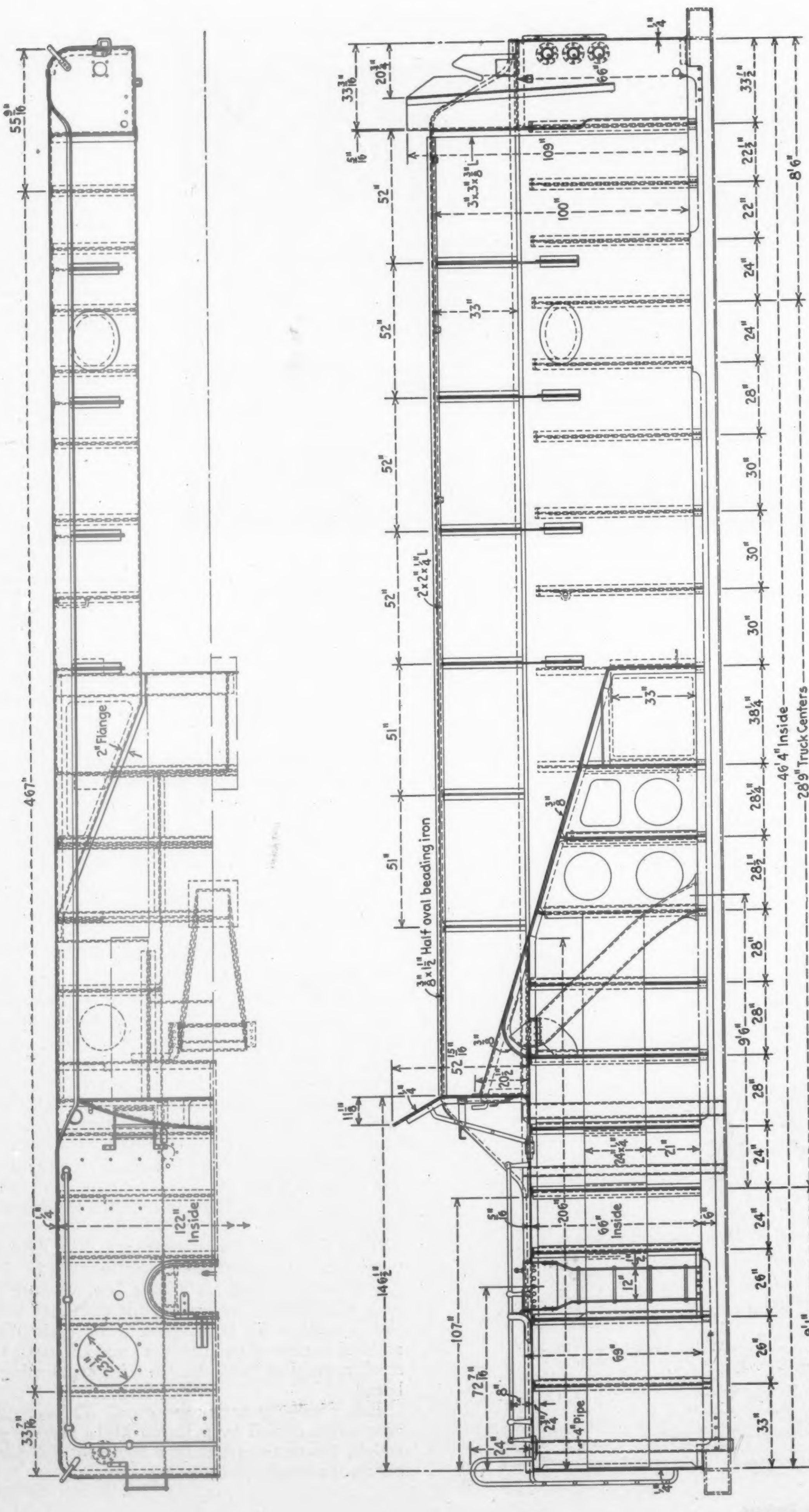
The engine truck is the General Steel Castings Corporation's constant resistance type with carbon-vanadium axles and roller bearings. Timken bearings on the passenger locomotives and SKF bearings on the freight locomotives. The trailer truck is the Delta outside-bearing type with Timken bearings mounted on carbon-steel axles. Provision is made for trailer brakes and on the freight locomotives for boosters which will be applied by the railroad.

The Running Gear

All bushings on the engine trucks and in the engine bed are Ex-Cell-O. The piston, piston-rod and crosshead assemblies were furnished by the Timken Roller Bearing Company. The heads are steel with American Hammered piston rings; the rods are chrome-nickel-molybdenum steel with the Timken grooved fit in the aluminum-alloy-shoe alligator-type crossheads. The wrist pins are case-hardened nickel-chrome steel. King type packing is used on the rods. The passenger power has $\frac{3}{8}$-in. head-to-head clearance, front and back and the freight locomotives $\frac{1}{4}$ in. at the back and $\frac{1}{2}$ in. at the front. The piston fits are interchangeable on all 50 locomotives.

The side and main rods are I-section manganese-vanadium steel, normalized and tempered. Hunt-Spiller gun iron with Magnus bronze bushings are used at the main pin floating bushings while the latter bushing material is used at all other pins. The main pins are normalized carbon-vanadium steel and the others are carbon steel, normalized and drawn. All crank pins are hollow bored.

Baker valve gear is used on all 50 locomotives. This gear is controlled by a Barco M-13 reverse gear on the freight locomotives and by a Franklin F-2 precision gear on the passenger locomotives.



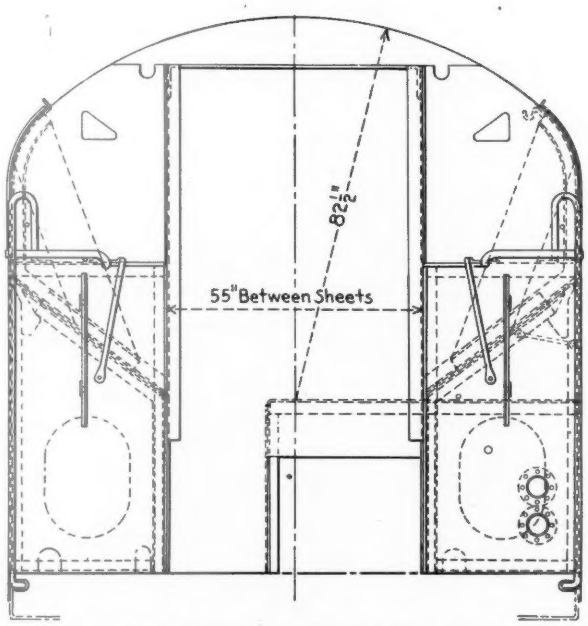
Plan and elevation of 15,500-gallon, 43-ton fuel capacity tender for the New York Central L-3 class locomotives

The Cab

The cabins built of No. 35½ hard, No. 8 gage aluminum with ⅜-in. steel rivets and wood lining. Aluminum is also used for angles, tees, bead and trim, gage board, cab-door frame, stationary rear windows and cab deck side sheets. The deck is diamond-pattern steel plate.

The cab is supported at the rear by a bracket on the bed and at the front by a patented cab saddle which allows for firebox expansion.

The cab interior is arranged for maximum accessibility to controls and has a single seat on the right side with two seats on the left side.



Front elevation of the tender tank

Lubrication

The extent to which mechanical and pressure grease lubrication has been used on these locomotives may be seen by reference to the accompanying table, indicating locations lubricated and the type of equipment used. The mechanical lubricators are mounted on the right and left sides of the engine and are actuated by linkage from the top of the combination lever.

Brake Equipment

The foundation brake equipment is the American Brake Company's design and the operating equipment

Partial List of Equipment and Materials on the New York Central 4-8-2 Type Locomotives

Engine bed; engine and trailer trucks; bumper beams; ash pans	General Steel Castings Corp., Eddystone, Pa.
Nickel cast-steel engine-bed pedestal caps; nickel-chromium-molybdenum steel forgings for all reciprocating parts other than main side rods	The International Nickel Company, Inc., New York.
Engine-bolt iron	Lockhart Iron & Steel Co., McKees Rock, Pa.
Hexagon nuts	(25) Scientific Production Corp., New York.
Pilots	(25) General Steel Castings Corp., Eddystone, Pa.
Springs	(25) American Locomotive Co., Railway Steel Spring Div., New York. (25) Crucible Steel Co. of America, New York.
Driving wheels	(40) General Steel Castings Corp., Eddystone, Pa. (10) Union Steel Castings Div. of Blaw-Knox Co., Albion, Mich.
Engine-truck and trailer wheels	(25) Carnegie-Illinois Steel Corp., Pittsburgh, Pa. (25) Armco Railroad Sales Co., Middletown, Ohio.
Tires	(35) American Locomotive Co., New York. (15) Bethlehem Steel Co., Bethlehem, Pa.
Lateral-cushioning devices	American Locomotive Co., New York.
Automatic compensators and snubbers	(25) Franklin Railway Supply Co., Inc., New York.
Hot-box alarms	(25) Magnus Metal Div., National Lead Co., New York. (25) The Timken Roller Bearing Company, Canton, Ohio.
Roller bearings:	
Driving wheels	(25) The Timken Roller Bearing Company, Canton, Ohio.
Engine truck	(25) The Timken Roller Bearing Company, Canton, Ohio. (25) SKF Industries, Philadelphia, Pa.
Trailer wheels	(50) The Timken Roller Bearing Company, Canton, Ohio.
Brake equipment	New York Air Brake Co., New York.
Engine-truck brakes	(25) American Brake Shoe & Foundry Co., New York.
Driver brakes	American Brake Shoe & Foundry Co., New York.
Coupler, drop	(25) National Malleable and Steel Castings Co., Cleveland, Ohio.
Uncoupling-shaft brackets	Standard Railway Equipment Co., Chicago.
Radial buffer	Franklin Railway Supply Co., Inc., New York.
Boiler and firebox steel	(25) Bethlehem Steel Co., Bethlehem, Pa. (25) Otis Steel Co., Cleveland, Ohio.
Firebox steel, deoxidized	(35) Lukens Steel Co., Coatesville, Pa.
Firebrick	(25) American Arch Co., Inc., New York. (25) General Refractories Co., Philadelphia, Pa.
Hot rolled steel sheets	(35) Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Boiler studs	Crucible Steel Co. of America, New York.
Staybolt iron	Joseph T. Ryerson, Inc., Chicago.
Flexible staybolts and sleeves	Flannery Bolt Co., Bridgeville, Pa.
Steel tubes and flues	(5) Steel & Tubes, Inc., Cleveland, Ohio.
Boiler and cylinder lagging	Johns-Manville Sales Corp., New York.
Boiler jacket	Carnegie-Illinois Steel Corp., Pittsburgh, Pa.
Blower valves	(25) The Lunkenheimer Company, Cincinnati, Ohio.

The tender coal capacity is 43 tons

Steam-pipe casing	(35) American Locomotive Co., New York. (15) Lima Locomotive Works, Lima, Ohio.
Superheater	The Superheater Company, New York.
Superheater units	(25) Steel & Tubes, Inc., Cleveland, Ohio. (25) Pittsburgh Steel Co., Pittsburgh, Pa.
Throttle	American Throttle Co., New York.
Throttle air-joint packing	(35) The Garlock Packing Company, Palmyra, N. Y.
Steam drier:	
Main dry pipe	The Superheater Company, New York.
Turret dry pipe	Dri Steam Valve Sales Corp., New York.
Smokebox hinges	The Okadee Co., Chicago.
Smokebox screen	(35) Wickwire Spencer Steel Co., New York. (15) The W. S. Tyler Co., Cleveland, Ohio.
Feedwater heater	(35) Worthington Pump and Machinery Corp., Harrison, N. J. (15) The Superheater Company, New York.
Feedwater strainers	The Okadee Company, Chicago.
Injector, non-lift; boiler checks, injector type and feedwater heater	Nathan Manufacturing Co., New York.
Deck sprinklers	Locomotive Equipment Division of Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Blow-off cocks	(25) The Okadee Company, Chicago. (25) Wilson Engineering Corp., Chicago.
Blower-pipe elbows	Barco Manufacturing Co., Chicago.
Washout plugs, arch tube, cylinder port, tank drain and smokebox inspection	Huron Mfg., Detroit, Mich.
Continuous blowdown	National Aluminate Corp., Chicago.
Stoker	Standard Stoker Co., Inc., New York.
Grates	Waugh Equipment Co., New York.
Ash-pan flusher	The Okadee Company, Chicago.
Fire door	Standard Railway Equipment Co., Chicago.
Cylinder bushings; piston-valve bushings; valve bull rings; valve-packing-ring castings; outer bushings	Hunt-Spiller Manufacturing Corporation, Boston, Mass.
Steel bushings	Ex-Cell-O Corporation, Detroit, Mich.
Cylinder cocks	The Okadee Company, Chicago.
Piston and piston rod	The Timken Roller Bearing Company, Canton, Ohio.
Piston-rod and valve-stem packing	U. S. Metallic Packing Co., Philadelphia, Pa.
Piston packing rings	Koppers Company, American Hammered Piston Ring Div., Baltimore, Md.
Manganese vanadium alloy in rods	Vanadium Corp. of America, New York.
Valve gear	Pilliod Co., New York.
Crosshead	The Timken Roller Bearing Company, Canton, Ohio.
Drawbar (Safety bar)	Franklin Railway Supply Co., Inc., New York.
Top guides, floating	American Locomotive Co., New York.
Bearing metal for driving-boxes, rods, and miscellaneous	Magnus Metal Div., National Lead Co., New York.
Reverse gear	(25) Franklin Railway Supply Co., Inc., New York. (25) Barco Manufacturing Co., Chicago.
Reverse-gear flexible connection	Packless Metal Products Corp., Long Island City, N. Y.
Aluminum cab, running boards, dome and steam-turret casing	Aluminum Co. of America, Pittsburgh, Pa.
Cab side windshield	American Locomotive Co., New York.
Cab side windows	The O. M. Edwards Co., Inc., Syracuse, N. Y.
Cab seat box cushions	Sponge Rubber Products Co., Derby, Conn.
Clear vision windows	The Prime Manufacturing Co., Milwaukee, Wis.
Shatterproof glass	(35) Pittsburgh Plate Glass Co., Pittsburgh, Pa.
Cab curtains	Lehon Co., Chicago.
Cab apron	Alan Wood Steel Co., Conshohocken, Pa.
Air gages	Ashton Valve Co., Boston, Mass.
Steam gages, water-level indicator, safety valves	Locomotive Equipment Division of Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Miscellaneous cocks and valves	(25) Ohio Injector Co., Wadsworth, Ohio. (10) Walworth Company, New York. (15) Crane Co., Chicago.
Water column	Nathan Manufacturing Co., New York.
Water-gage glass	Corning Glass Works, Corning, N. Y.
Water-gage guard	The Okadee Company, Chicago.
Sander valves and traps	Graham-White Sander Corp., Roanoke, Va.
Low-water alarm	Barco Manufacturing Co., Chicago.
Sander hose	(35) United States Rubber Co., New York. (15) New York Air Brake Co., New York.
Train control	General Railway Signal Co., Rochester, N. Y.
Cut-off and speed recorder	Valve Pilot Corporation, New York.
Whistle-operating equipment	Viloco Railway Equipment Co., Chicago.
Bell ringer	Railway Service and Supply Corp., Indianapolis, Ind.
Bell chain	American Chain Div. of American Chain & Cable Co., Inc., Bridgeport, Conn.
Marker lamps	(35) Lovell-Dressel Co., Inc., Arlington, N. J.
Headlight generator, electric fittings, cab lamps	Pyle-National Co., Chicago.
Steam hose	Quaker City Rubber Co., Philadelphia, Pa.
Steam-heat regulator	Vapor Car Heating Co., Inc., Chicago.
Copper piping	(25) Phelps Dodge Copper Products Corp., New York.
Pipe-clamping system	Franklin Railway Supply Co., Inc., New York.
Pipe insulation	Union Asbestos & Rubber Co., Chicago.
Wrought-iron pipe	(35) A. M. Byers Co., Pittsburgh, Pa. (15) Cohoes Rolling Mill Co., Cohoes, N. Y.
Universal joints	The Okadee Co., Chicago.
Lubricators, mechanical	(25) Nathan Manufacturing Co., New York. (25) Detroit Lubricator Co., Detroit, Mich.
Grease fittings	Alemite Div. Stewart-Warner Corp., Chicago.
Oil fittings	Universal Lubricator Systems, Oakmont, Pa.
Hose for grease connection at air pumps	Chicago Pneumatic Tool Co., New York.
Oil-resistant hose	(35) The Flex-O-Tube Co., Detroit, Mich.
Oil cans	(25) Johnson Mfg. Co., Urbana, Ill.
Valve oil	(35) Socony Vacuum Oil Co., Inc., New York.
Flexible connections between engine and tender and at generator	Barco Manufacturing Co., Chicago.
Paint	(35) E. I. duPont de Nemours & Co., Wilmington, Del. (15) The Glidden Co., Cleveland, Ohio.
Welding wire	The Lincoln Electric Co., Cleveland, Ohio. Magnus Metal Div., National Lead Co., New York. John A. Roebling's Sons Co., Trenton, N. J.
Torpedoes	(35) Standard Railway Fusee Corp., Boonton, N. J.
Tender:	
Frame	General Steel Castings Corp., Eddystone, Pa.
Wheels	(25) Carnegie-Illinois Steel Corp., Pittsburgh, Pa. (25) Armco Railroad Sales Co., Middletown, Ohio.
Truck-box housings (on Alco locomotives)	Clails Equipment, Buchanan, Mich. Electric Steel Castings Co., Indianapolis, Ind.
Roller bearings	(25) The Timken Roller Bearing Co., Canton, Ohio. (25) SKF Industries, Philadelphia, Pa.
Simplex clasp and body brake	American Steel Foundries, Chicago.
Brake shoes	American Brake Shoe & Foundry Co., New York.
Draft gear	Waugh Equipment Co., New York.
Coupler and two-key draft-gear attachment	Symington Gould Corp., Rochester, N. Y.
Uncoupling shaft brackets	Union Metal Products Co., Chicago.
Tank-filling hole cover lock	Ramapo Ajax Div., American Brake Shoe & Foundry Co., New York.
Coal pusher	Standard Stoker Co., Inc., New York.
Water-level indicator	Locomotive Equipment Div. of Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Waterscoop cylinder relief valves	New York Air Brake Co., New York.

is the New York Air Brake Company's Schedule 8ET with two 8½-in. 120-cu.-ft.-per-min. cross-compound compressors mounted on the bed ahead of the smokebox. These compressors are equipped with air filters having removable cartridges. The engine trucks of the passenger locomotives, Class L3a, have brakes with cylinders on the truck frames. The passenger power is also equipped with train signal and steam heat.

The main sand box has a capacity of 2,700 lb. Graham-White sanders are used on the drivers of all 50 locomotives and on the trailer wheels of the L3a locomotives. The driving-wheel sanders are manually operated and the trailer sanders are automatically operated.

(*Continued on page 21*)

Illinois Central Installs Two

Oil-Hydraulic Rail Cars

Deluxe motor cars, for main-line service, are each powered with two 225-hp. Waukesha-Hesselman spark-ignition oil engines, are air conditioned and built of alloy steel

WITHIN the past month the American Car and Foundry Company has delivered, from its Berwick, Pa., plant, two lightweight, alloy-steel rail cars to the Illinois Central. One of the cars will operate on a 183.1 mile run between Jackson, Miss., and New Orleans, La., and is named "Miss Lou" after the two states. The other car, named the "Illini," will cover a 126.4-mile run between Chicago and Champaign, Ill. The operating schedule for these cars calls for average speeds of 45.8 and 49.1 m. p. h., respectively.

The two cars are similar in general arrangement and construction, are styled alike in the interiors but differ principally in the location of toilet and buffet facilities and the center entrance of the Miss Lou.

Each car is built of low-alloy, high-tensile steels and is designed to withstand the 100,000-lb. buffing load which complies with railway mail service requirements for a series of coupled cars of a total light weight of 300,000 lb. on the rails. Power is supplied by two 225-hp. oil engines through Twin-Disc clutches and torque converters to a geared axle drive on each truck.

The cars are capable of a maximum speed of 73.5 m. p. h. and can attain that speed on level tangent track in 2 min. 55 sec. over a distance of 2.0 miles.

The Car Structure

The underframe is built up of rolled Z-section side sill members to which the transverse equipment supports and the floor supports are welded. Rolled channel-shaped center sills are welded in fore and aft of the bolster in order to carry the buffing loads back to the bolster and first crossbearer and thence to the side girders. A combination of rolled Z-shapes spanning from side sill to side sill and insulated from the car floor are welded in to facilitate three-point suspension of the pancake engines mounted beneath the floor.

The bolster is of welded construction consisting of top and bottom cover plates which are welded to web plates. Flange stiffeners and gussets are welded in at the vulnerable points in order that the stresses will be smoothly transferred.

By means of this box section and lightening holes on the neutral axis an exceedingly light bolster was obtained with a comparatively high safety factor.

Light gage steel false floor sheets were then welded to the above mentioned underframe members, thus forming a water-tight and fireproof bottom covering for the floor.

Weights and Dimensions of Illinois Central Rail Cars

Light weight of body shell, lb.	20,750
Light weight of finished car body on center plates, lb.	64,589
Trucks, lb.	20,720
Total light weight on the rails, lb.	85,309
Estimated water, fuel, oil, crew, etc., lb.	4,300
Total service weight on the rails, lb.	89,609
Total load, passengers, lb.	10,350
Total loaded weight on the rails, lb.	99,959
Length overall, ft.-in.	75 — 0
Width overall, side frame, ft.-in.	9 — 6
Height, rail to top of roof, ft.-in.	11 — 8¾
Height, rail to top of floor, ft.-in.	3 — 5⅜
Height, floor to ceiling air duct, ft.-in.	7 — 2
Seating capacity on the Illini	69
Seating capacity on the Miss Lou	61

The side frame is of girder-type construction with a rolled angle side sill or bottom chord and a light-weight rolled Z-bar side plate or top chord member. The posts are a pressed flanged U-section which when spot welded to the 14-gage side sheets form a very stiff, but light-weight box section.

The "Illini" will operate between Chicago and Champaign, Ill.

The buffet and saloons are at the rear end of the Illini (as shown here) and grouped at the center of the Miss Lou—The interior decorative schemes are alike on both cars

The belt rails and window headers consist of pressed Z-shaped members, and are so arc welded to the side posts that they function as continuous members.

All of these framing members are first carefully jigged for location and alinement and then arc-welded together forming a skeleton or backbone to which the side sheets are then spot welded. All framing members are USS Cor-Ten steel.

The roof framing consists of a lightweight side plate angle to which is arc welded pressed Z-shaped carlines. Four Z-shaped purlines are welded to the carlines and run the entire length of the car and when riveted together with the carlines and the 1/16-in. aluminum roof sheets form a stiff sub-assembly which when finally riveted to the side frames makes an extremely stiff unit. Further rigidity is gained by the light trussed framing which is fastened beneath the carlines to support the headlining and the air-conditioning duct, as well as the Pyle National center ceiling and low-pressure duct.

Both end frames are built up of welded construction with substantial end posts from the center sills at the bottom to the anti-telescoping sheet at the top. Both front and rear ends are designed to meet the new railway mail service requirements. The front end is made to accommodate five windows which give the operator excellent vision around the entire front of the car. The rear end has a standard coupler and draft gear and is equipped with face plates and diaphragms for the possible addition of a trailer at some later date.

The side sheathing of these cars is Armco high-tensile steel. The car sides, ends, roof and floor are insulated with Johns-Manville Stonefelt.

General Description

These rail cars were especially built for fast passenger service and secondary service on main lines and, therefore, the wide vestibules were equipped with swing doors and retractable steps to facilitate speedy loading and discharge of passengers. The steps, when locked in the closed position, carry a section of the skirting which covers the step well thus maintaining the streamline appearance on the exterior of the car.

O. M. Edwards Company's double-glazed dehydrated sash was used, the inner sash being made removable for cleaning purposes.

The seats are the reclining back type furnished by Karpen and upholstered in L. C. Chase needlepoint.

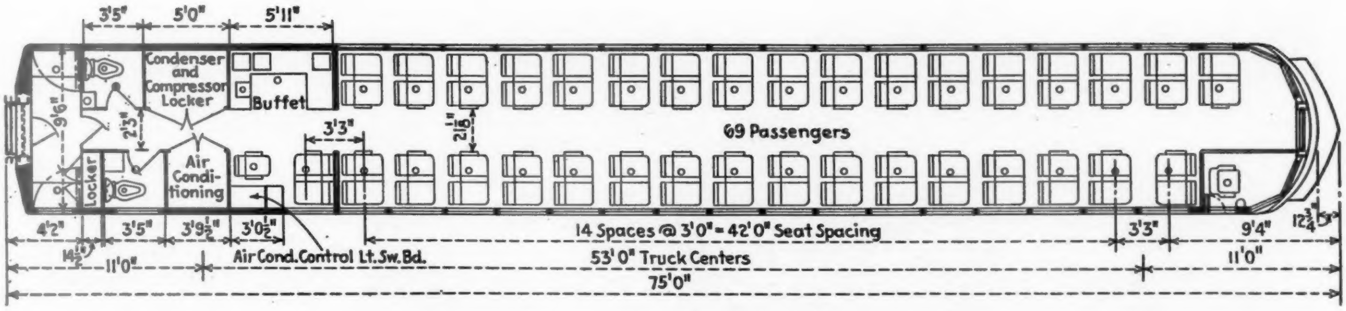
Over each seat is a Luminator side ceiling light fixture,

Full-length interior of the Illini

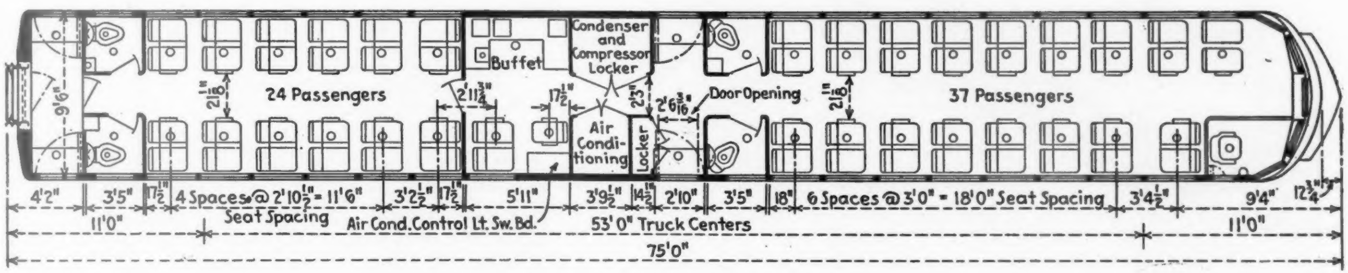
the lens of which is so made that there is an ample supply of light at the reading plane.

The cars are air-conditioned and heated with the American Car and Foundry Company's all-weather unit. The 6½-ton capacity air-conditioning unit is so installed that the air is taken in through large grilles in the evaporator unit, is then blown through high-pressure ducts in the ceiling and thence through the low pressure Pyle National ducts for distribution to the interior of the car.

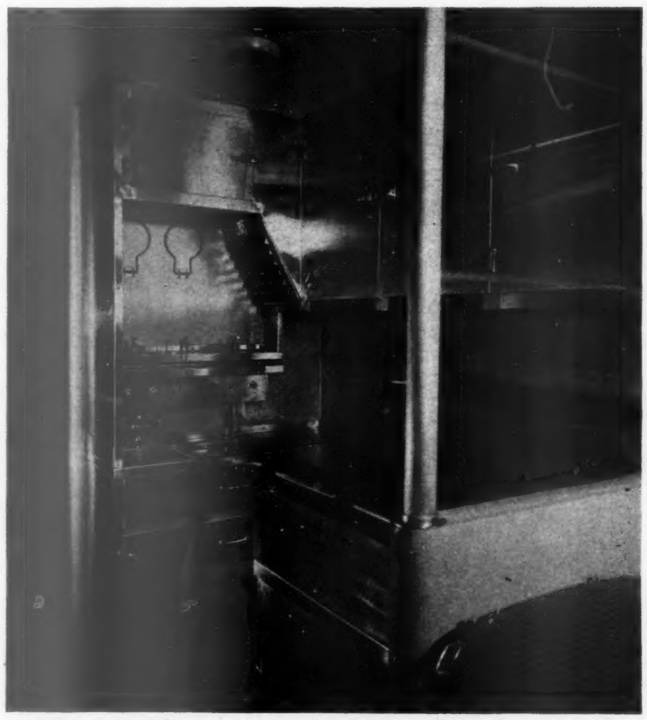
The heating is accomplished by reversing the air flow through the above-mentioned unit, the air being passed through fin coils which are heated by the hot water from



Floor plan of the "Illini," No. 130



Floor plan of the "Miss Lou," No. 131



The buffet in No. 130

the engine cooling system. The air is then blown downward and carried throughout the car in ducts located at each side of the car under the seats.

Supplementing the available heat from the hot water in the engine cooling system, and in order to give more flexibility in the thermostatic temperature control, a 12-kw. electrical heating unit was also added in the heating and cooling locker.

Interior and Exterior Decoration

The exteriors of the two cars are different as to color scheme only.

The Illini, which will go into service between Chicago and Champaign, is painted blue and orange incorporating the use of the University of Illinois colors. The navy blue being used on the lower girder and above the windows at the front end, the orange below the girder on the skirting and on the letterboard above the windows. The piers are gray simulating glass which render them less conspicuous. The roof is finished in an aluminum paint.

The Southern car, or Miss Lou, incorporates the colors of the Mississippi and Louisiana state universities, purple and gold, and blue and red, respectively.

The lower girder and the letterboard above the front windows is painted blue and the skirting and letterboard at the side is red. The purple and gold is used in the striping around the windows and the vertical piers are treated the same as the Illini.

The interior decorative schemes of both cars are alike and is built up around the two shades—blue and gray.

The wainscoting or dado, painted a strong blue, forms a perfect background for the seats, six of which at either end of the compartment are upholstered in a soft blue dual tone striped bonpoint material. Those in between are covered in the same type fabric in soft gray.

This arrangement of dark tone seats at opposite ends of the compartment gives the illusion of shortening it, thus taking away the long tunnel appearance usually seen in the standard passenger car.

The window capping is black, while the piers, facis and bulkheads are a light shade of blue gray.

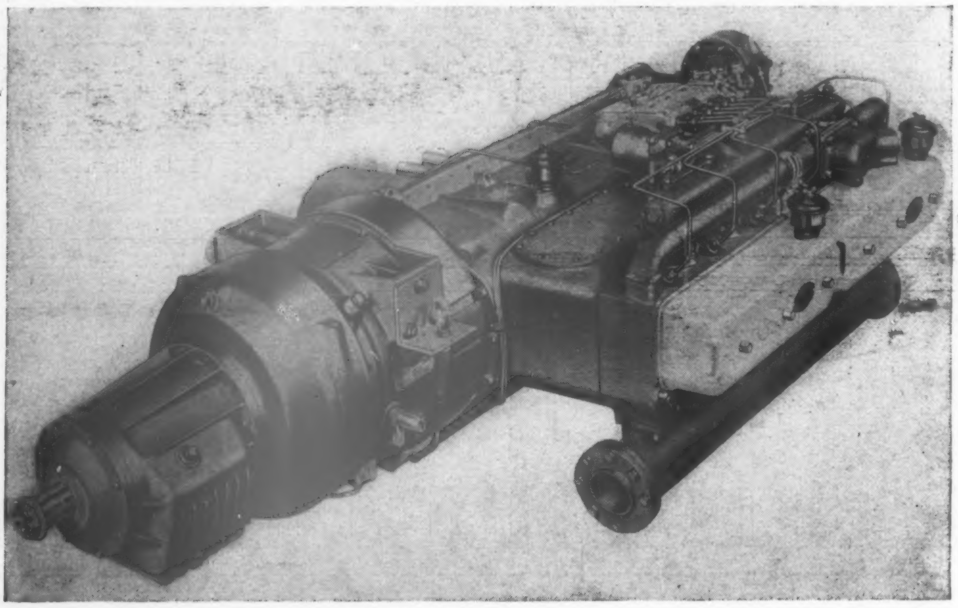
The Excel curtains are a gray faced Moonray material with an orange accent stripe across the bottom.

The side and center ceiling are egg shell ivory and are separated by two 16-in. bands of light gray which set off the side ceiling lights. The lights are finished in satin finished chrome in keeping with all of the hardware in the car. An orange stripe each side of the air duct introduces an interesting note of contrast.

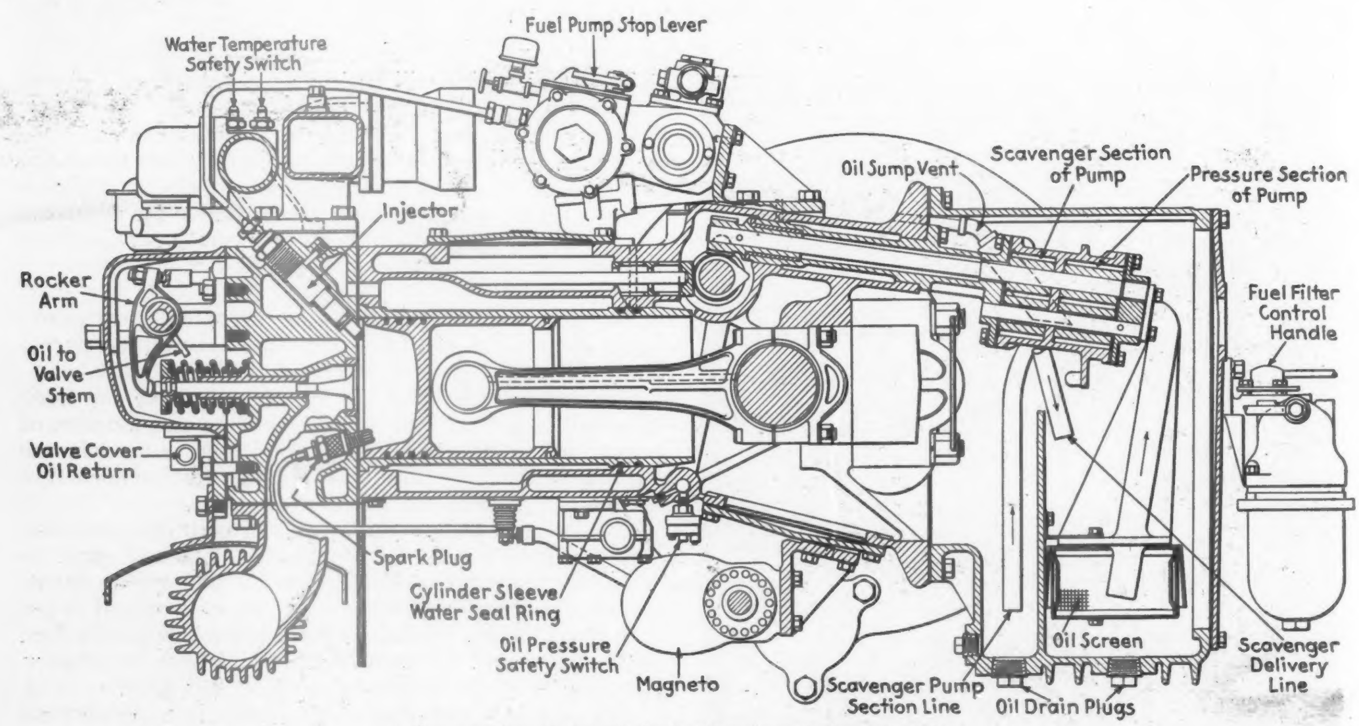
The basket racks, furnished by Adams and Westlake, are of tubular design and satin chrome finish.

The floor is covered with Armstrong taupe linoleum and has rectangular block inlaid decorations of blue and orange repeating at nine-foot increments throughout the aisle.

The cab at the forward end of the car is merely sur-



The power plants consist of two six-cylinder Waukesha-Hesselman 225 hp. oil engines with Twin Disc Clutch and torque converter and free-wheeling unit



Cross section of the Waukesha-Hesselman horizontal engine

rounded with a tubular railing thus leaving the entire front end open above the seat level for the clear vision of all passengers.

The bulkhead at the rear of the compartment appears to be a large arch. However, the door is framed on each side by large glass openings beyond which can be seen the stainless steel buffet. The buffet was furnished by Angelo Colonna and is compact, and efficiently designed for serving light lunches.

The Power Plant and Transmission

The six-cylinder engines for these cars burn Diesel oil, but are not Diesel engines. They are built for American Car and Foundry Company by the Waukesha Motor Company, Waukesha, Wis., under license of the Hesselman Motor Company, Stockholm, Sweden. Each engine is a solid injection, low-pressure, electric ignition oil engine.

In operation, the Hesselman engine, like the Diesel engine, draws in a charge of air alone, which is then compressed to a maximum compression pressure from 135 to 140 lb. per sq. in. Near the top of the compression stroke, the Bosch fuel pump injects a metered charge of fuel oil into the turbulent air stream where it is mixed thoroughly and is swept around the combustion space past the electrodes of the spark plug, which is on the opposite side. At this point, the spark plug fires the charge and the piston moves forward on the power stroke. Near the end of the power stroke, the exhaust valve opens, releases the burned gas and the cycle is repeated.

Each engine develops 225 hp. at 1,800 r. p. m. and will operate either independently or together from one control station, permitting flexibility in car performance as well as in the selection of the actual power applied. The engines are 6¼-in. bore by 6½-in. stroke.

The operator's control position

A—Torque converter fluid pressure gages
B—Master controller
C—Bell ringer valve
D—Torque converter fluid reserve tank
E—Heater switch
F—Warning light—rear engine 12-volt system
G—Headlight switch
H—Warning light-front engine 12-volt system
I—Brake valve
J—Cab light switch
K—Defroster switch
L—Priming fuel pump switch-front engine
M—Instrument board light switch
N—Classification and marker light switch
O—Starting motor switch—front engine
P—Priming fuel pump switch—rear engine
Q—Ammeter—125-volt system
R—Starting motor switch—rear engine
S—Air pressure gage
T—Speedometer
U—Cab heater
V—Sander pedal
W—"Deadman" pedal (not visible)

The engines are equipped with full safety devices, which protect them against overheating, loss of lubricant, low oil pressure or low cooling water supply. They are started by conventional electric starters, which is possible due to their low compression pressure and relative ease with which they may be cranked.

The transmission is a hydraulic torque converter which includes a direct drive feature. It is manufactured by the Twin Disc Clutch Company and is designed especially for rail motor car use. The torque converter consists of two elements: One, the hydraulic element which provides torque multiplication for acceleration and performance on heavy grades; the other, the direct drive element which couples the engine directly to the drive axle for operation at higher speeds and on lesser grades. There is a duplex clutch in the torque converter for the engagement of either the hydraulic or direct drive element. A free-wheeling device is used on the power take-off shaft to permit the car to drift freely without the retarding effect caused by engine drag when the engines are not driving the car. The free-wheeling device will also permit the operation of either engine if the other is inoperative. The duplex clutch is actuated electro-pneumatically. An electrically-controlled air cylinder shifts the clutch on both torque-converters simultaneously and has a neutal position when neither of the duplex clutches is engaged.

Car operation is controlled by a master controller which in the "off" position completely shuts off fuel oil from both engines. The first controller position allows the engine to idle at approximately 800 r. p. m. In the next seven positions, engine speed is increased and the car moves through the hydraulic drive to a maximum engine speed of 1,800 r. p. m. or approximately 45 m. p.h. car speed. Here the controller handle has a stop. When the stop is released and the handle moved to the next position, the engine speed drops to 800 r. p. m. and the shift from hydraulic to mechanical drive is made automatically by an electro-pneumatic cylinder on the Twin Disc torque converter. From this point there are nine controller positions in mechanical drive through which engine speed is increased to a maximum of 1,800 r. p. m. and a car speed of 73.5 m. p. h. The reverser handle on the controller is interlocked so that the main speed control handle can not be moved when the reverser handle is in the neutral position.

Forward and reverse operations are accomplished by shifting a sliding jaw clutch in each of the two drive axles. Each drive axle has two floating spiral bevel ring gears meshing with a common pinion. The jaw clutch is locked to the drive axle shaft by splines and engages one ring gear or the other depending on which direction the car is to operate. The forward and reverse shifts on the two drive axles are synchronized and actuated by an air cylinder controlled by an electric switch in the operator's cab. Both axles are shifted simultaneously.

All of the power and control equipment is located under the floor of the car. The hydraulic torque converter is bolted directly to the engine flywheel housing. Power is transmitted from the torque converter by means of a drive shaft toward each truck. The outer end of each drive shaft is retained by a midship bearing. From these points the power is transmitted by means of a propeller shaft having two solid universal joints to each drive axle. Each propeller shaft projects through a clearance hole in its respective truck bolster.

Accessories are driven by V-belts from a main sheave which is in turn driven by the propeller shaft from the timing gear end of each engine crankshaft. Half of the accessories are driven by each engine so that accessory power is divided equally between the two. The accessories for each engine consist of one 20-kw. 125-volt d.c. generator, one 12-volt generator, one engine cooling water pump, and one Bendix-Westinghouse 12 c. f. m. air compressor.

Each engine has two sections of water cooling radiators arranged across the car adjacent to the accessories and their belt drives. The radiator cores are of the fin and tube type. Engine water temperature is regulated by Kysor automatic thermostatically-controlled radiator shutters. These shutters are operated by a thermostatic air valve and an air operating cylinder and by means of felt inserts in the vane edges are tightly closed in the closed position. The thermostat tube is located in the water line between the engine outlet and the top of the

radiator. When the temperature of the engine cooling water reaches 188 deg., the shutters open and remain open until the temperature drops to 180 deg. at which point they close. Radiators are cooled by 26-in. diameter aluminum fans, one of which is driven by each engine. Each fan is driven by a propeller shaft having a flexible rubber joint at each end, and one end of which is attached to each main belt sheave. The engine cooling water also cools the torque converter fluid by means of heat exchangers. Car heat is obtained from engine cooling water which is supplemented by electric heat from one or both of the 20-kw. generators in cold weather. These generators supply current for air conditioning, etc., during summer operation.

Electrical Equipment

Electrical equipment on these cars is based on using a dual voltage system, i. e., 12 volts and 125 volts. The 12-volt system is used for engine starting, headlight, defroster, and other small accessories. Each headlight is equipped with a 12-volt 30-ampere bulb which gives a pickup distance considerably in excess of a conventional locomotive headlight. The 12-volt 25-plate battery is charged from a 40-ampere generator belt driven from the engine.

Each power plant belt drives a 125 volt, 20 kw. generator over a speed range of nearly 4 to 1. Cool, clean air for each generator is supplied through a louvred opening in the side of the car which has a suitable duct connection to the generator. Two generators on each car are operated in parallel through an equalizing resistor and supply the necessary power for air conditioning, electric heat, electric range, hot water, lights, control and other electrical accessories and at the same time charges a 56 cell KX-7H Exide Ironclad battery. The electrical control circuits are so arranged that the cars can be arranged for multi-unit operation when necessary.

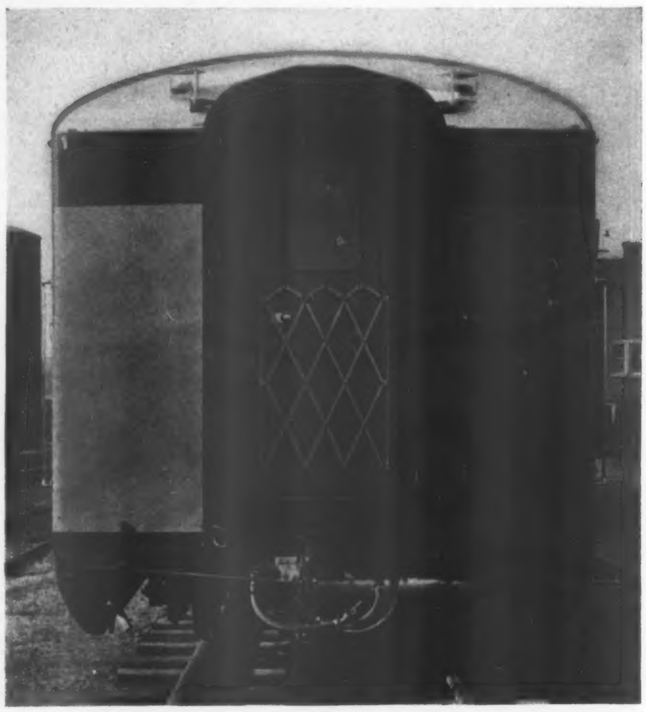
The power trucks have coil springs over the Timken roller-bearing journal boxes with the bolster supported on elliptic springs—The geared axle drive with shifting mechanism is in the foreground

Partial List of Materials and Equipment on the Illinois Central Rail Cars

Steels, low-alloy, high-tensile.	Carnegie-Illinois Steel Corp., Pittsburgh, Pa.; Armco Railroad Sales Co., Middletown, Ohio.
Steel, open-hearth	Carnegie-Illinois Steel Corp., Pittsburgh, Pa.
Aluminum; step treads	Aluminum Co. of America, Pittsburgh, Pa.
Insulation	Johns-Manville Sales Corp., New York.
Couplers	McConway & Torley Co., Pittsburgh, Pa.
Roller bearings	The Timken Roller Bearing Company, Canton, Ohio.
Wheels; axles	Carnegie-Illinois Steel Corp., Pittsburgh, Pa.
Brake shoes	American Brake Shoe & Foundry Co., New York.
Springs	American Locomotive Co., Railway Steel Spring Div., New York.
Air compressor	Bendix-Westinghouse Automotive Air Brake Co., Pittsburgh, Pa.
Air brakes	New York Air Brake Co., New York.
Hand brake	National Brake Co., Buffalo, N. Y.
Engine	Waukesha Motor Co., Milwaukee, Wis.
Torque converted	Twin Disc Clutch Company, Racine, Wis.
Propeller shaft and bearing	Spicer Mfg. Co., Toledo, Ohio.
Generators	General Electric Company, Schenectady, N. Y.
Radiators	Young Radiator Co., Racine, Wis.
Radiator shutters	Kysor Heater Co., Cadillac, Mich.
Batteries	Electric Storage Battery Co., Philadelphia, Pa.
Exhaust ventilating fans	Diehl Mfg. Co., Elizabethport, N. J.
Multi-vent panel	The Pyle-National Company, Chicago.
Air-conditioning control	Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
Cooling fans	B. F. Sturtevant Co., Hyde Park, Boston, Mass.
Air conditioning	American Car and Foundry Co., New York.
Headlights; charging receptacle	The Pyle-National Company, Chicago.
Light fixtures	Luminator, Inc., Chicago; Safety Car Heating & Lighting Co., New York.
Air sander	Graham-White Sander Corp., Roanoke, Va.
Cab heaters	Consolidated Car Heating Co., Albany, N. Y.
Sash	O. M. Edwards, Inc., Syracuse, N. Y.
Linoleum	Armstrong Cork Co., Lancaster, Pa.
Body seats	S. Karpen & Bros., Inc., Chicago.
Glass	Pittsburgh Plate Glass Co., Pittsburgh, Pa.
Window curtains and fixtures	Excel Curtain Co., Elkhart, Ind.
Locomotive bell and ringer	American Locomotive Co., Railway Steel Spring Div., New York.
Dual tone Leslie-Tyfons	Leslie Co., Lyndhurst, N. J.
Rear horn	Buell Mfg. Co., Chicago.
Basket racks	The Adams & Westlake Co., Elkhart, Ind.
Shock absorbers	Houde Engineering Corp., Buffalo, N. Y.

Trucks, Couplers and Brake Equipment

The trucks are the four-wheel type with cast-steel frames and bolsters. The axles are mounted in Timken roller bearings. The side frames are supported on the journal boxes by coil springs, and carry the bolster on full elliptic springs. The truck center plate is a new design, in which, by means of a Neoprene pad working partially in shear and in compression, isolates the car body from the truck. The trucks have inside brakes with cylinders mounted on the truck frames and are equipped with Hondaille shock absorbers to restrain both lateral and vertical motion.



The rear ends of these cars are designed and equipped for multiple-unit service

The air brake system is the New York Air Brake Company's Schedule SME straight air brake with automatic emergency feature designed to stop the cars at a braking rate of 2.5 m. p. h. per second at 75 lb. pressure.

The coupler at the front end is concealed within the sheathing and flush removable covers are used.

Steam Locomotives and

Train Acceleration*

By L. B. Jones†

A study of the relation between the cylinder tractive force of high-speed steam locomotives and the energy required to accelerate trains of differing weights at various rates

THE mathematics of the acceleration of railway vehicles has been fully discussed in various textbooks and also in previous papers presented before the society; but for convenience of ready reference the fundamental concepts are herein reviewed. The weights of locomotive and train are expressed in tons and acceleration is expressed in terms of miles per hour per minute or per mile, to conform with the customary statistics of train schedules, in distinction to the common formulas of physics and mechanics expressed in terms of pounds, feet, and seconds. By this means, it is hoped to record data which will be helpful to operating officers as well as to designing engineers. Because the energy of acceleration varies with the square of the velocity, but only directly with the weight of the train, simple arithmetical proportion is deficient when comparing different locomotives or different weights of trains at the higher speeds, and a graphic analysis is most useful to show what actually takes place.

The force available for acceleration in the cylinders of the ordinary two-cylinder steam locomotive is expressed by the well-known formula

$$T = \frac{C^2PS}{D}$$

where T = cylinder tractive force, lb.
C = mean diameter of the cylinders, in.
P = mean effective pressure, lb. per sq. in.
S = piston stroke, in.
D = diameter of drivers, in.

The formula contains three fixed dimensional values and only one value subject to variation with speed, i. e., the main effective pressure. It therefore follows that, as this value is maintained or increased, the cylinder tractive force will be maintained or increased; which is the only force, on level track, available to accelerate the train. Therefore, the ability of a steam locomotive to accelerate a train rests with its mean effective pressure.

In Figs. 1 and 2 are shown cylinder-horsepower and cylinder-tractive-force versus speed curves for several locomotives, in which curve A represents a Pacific-type locomotive which has been performing satisfactorily in main-line passenger service for several years. For the purpose of this study, curves B, C, D, and E represent successive improvements in the mean effective pressure of this same locomotive, but for simplification the studies of train acceleration are confined to the minimum or present locomotive A, and the maximum or improved locomotive E. The latter has been selected as the maximum locomotive for this study because, as shown in Fig. 1, the cylinder horsepower is maintained almost constant from 60 to 100 m.p.h. While it is sufficiently in advance of current steam-locomotive practice to be called a "maximum" locomotive, it is by no means an "ultimate" locomotive because, if the mean effective pressure could be still better maintained as the speed increases, the horsepower would actually increase with the speed above 60 m.p.h., as it now does below that speed.

If yet greater power must be obtained, a glance at the formula previously given will show that the only recourse is redesign, or the increase of one or more of the dimensional values. The advantages of improving the present locomotive, as compared with design changes, involving increased weight and capital investment, are illustrated by the curves in Figs. 4 to 8, inclusive, which have been developed on the assumption that improved locomotive E has been produced from present locomotive A without any increase in weight.

For this study, three trains weighing respectively 800, 1,000, and 1,200 tons behind the tender have been as-

* Abstract of paper contributed by the Railroad Division and presented at the annual meeting of The American Society of Mechanical Engineers in New York, December 2-6, 1940.

† Engineer of tests, Pennsylvania.

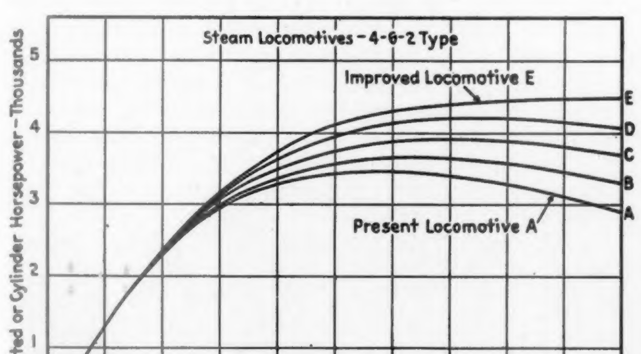


Fig. 1—Cylinder horsepower versus speed

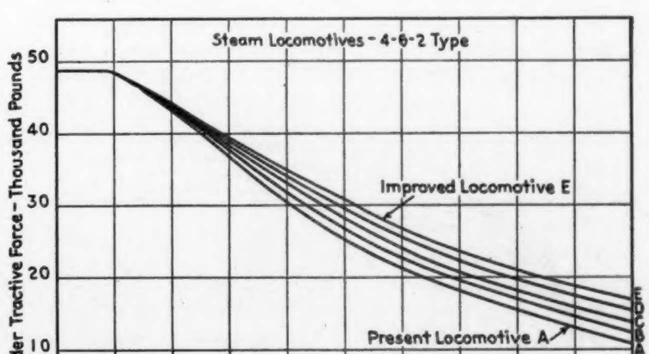


Fig. 2—Cylinder tractive force versus speed

sumed, and their gross resistances, based on the Davis formulas, are shown in Fig. 3. For simplicity, all calculations have been based on straight level track; the effect of grades, plus or minus, may be added or subtracted, and a similar correction may be made for curves. For purposes of comparing two or more locomotives, the assumption of level track will answer as well as any other condition which might be selected.

The curves involving speed, time, and distance were calculated from the tractive-force and resistance curves point by point and then verified by the mathematical for-

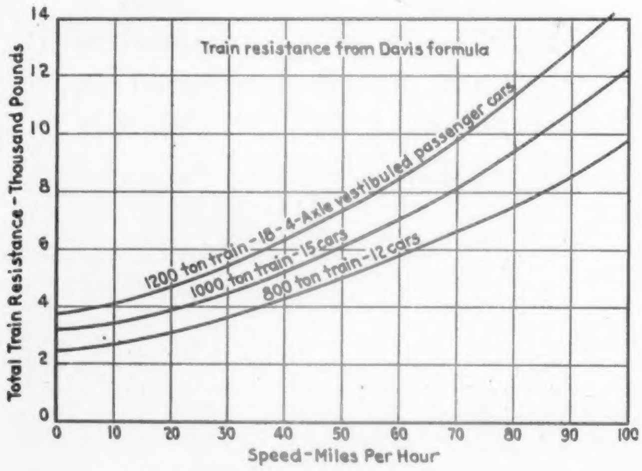


Fig. 3—Train resistance versus speed-level track

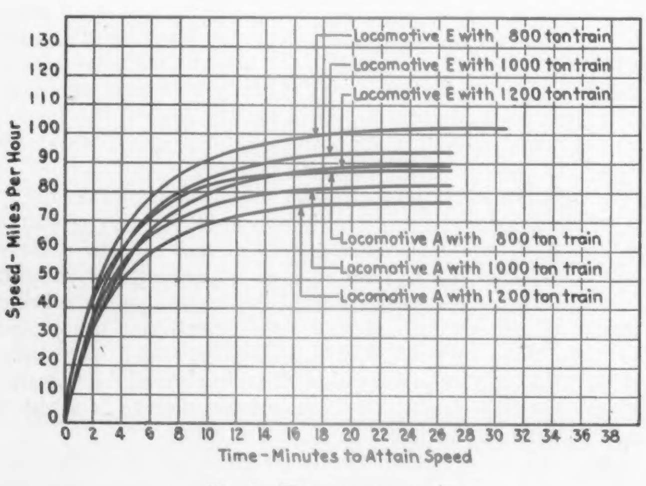


Fig. 4—Time versus speed

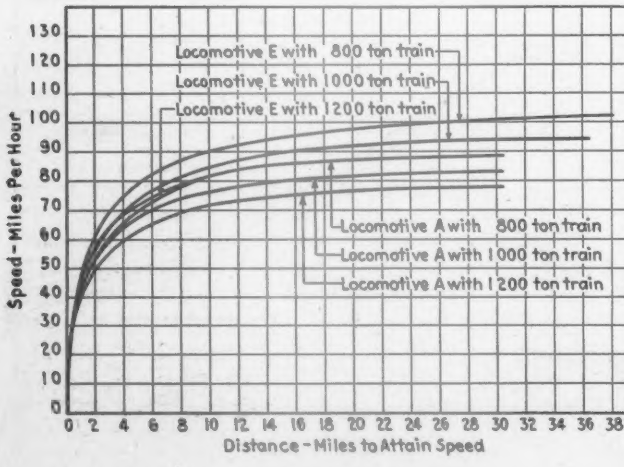


Fig. 5—Distance versus speed

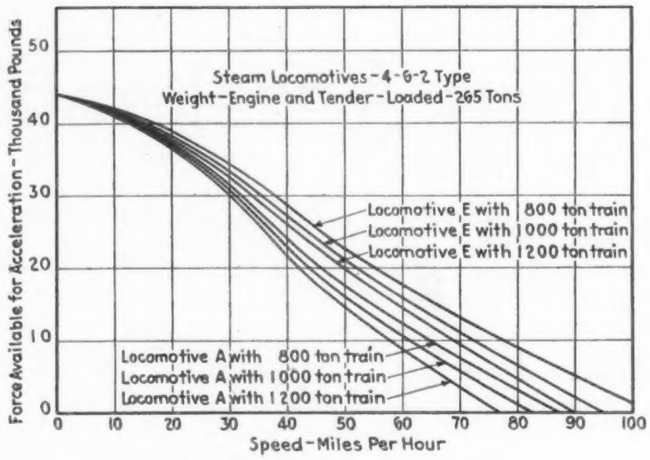


Fig. 6—Accelerating force versus speed

mulas presented in the Appendix.* In each case, the two methods checked very closely; and it is evident that acceleration curves can be constructed by the formulas which will reflect the effect of changes in the tractive-force curve on the performance of the locomotive. Since the curves are plotted for the minimum and maximum locomotives only, it is also evident that the performance of the intermediate locomotives, *B*, *C*, and *D*, can be studied from the curves by interpolation. It will be noted that the mathematical studies in the Appendix follow closely the methods of Professor Barrow.†

Fig. 4 compares present locomotive *A* with maximum locomotive *E*, hauling three different trains, and Fig. 5 illustrates the same comparison based on distance. It will be noted that the higher sustained horsepower of the improved locomotive results in a reduction of both time and distance required to attain a given speed.

Enforced Slowdowns—Effect on Train Operation

These curves also serve to emphasize a point which must be borne in mind by operating officers, and that is the serious handicap of enforced slowdowns. Locomotive *A* with an 800-ton train requires approximately 2½ min. or 1½ miles to attain 50 m.p.h., and 6½ additional min. or 7½ miles to attain 80 m.p.h.; so that, if the train is slowed from 80 to 50 m.p.h., 6½ min. or 7½ miles are required to resume the original speed. This should not be confused with elapsed time, which would include also time lost in slowing down and running at reduced speed, items not covered by this investigation.

Fig. 6 shows the force available for acceleration compared with speed. The locomotive has reached its maximum speed when the accelerating force becomes zero. To determine the maximum speed of the locomotives on a grade, it is only necessary to determine the grade resistance of the locomotive and train and draw a horizontal line at the corresponding value. The intersection of the curves with the line so drawn will show the maximum speed on the grade selected.

Fig. 7 shows a mathematical "race" between locomotives *A* and *E*. Starting from the same point, with trains of identical weight, it will be seen that, at the end

* The appendix included with this paper dealt with the equations for accelerating force and their applications. Ten cases were solved in accordance with the procedure given in detail in the appendix. They were for trains hauled by the present passenger locomotive *A* and the improved passenger locomotive *E* using 800-, 1,000- and 1,200-ton trains, a loaded 10-car passenger train made up of heavyweight cars and a loaded 10-car passenger train made up of lightweight cars.

† "Problems in Locomotive Acceleration," by A. C. Barrow, Civil Engineering, vol. 4, 1934, pp. 202-204.

of 12 min., locomotive *E* is 2 miles ahead of locomotive *A;* and the gap widens rapidly due to the more rapid acceleration of the improved locomotive.

Fig. 8 shows the effect of lightweight cars on the rate of acceleration. The weights of the two trains, with a given locomotive, are proportional to the time required to attain the same speed, and to the squares of the speeds attained in a given time. Therefore, it follows that, for a given maximum speed, the saving in schedule time by the lightweight train is confined to acceleration, and if there are no stops or speed reductions, the heavy train will require only a little more time to cover a given distance than the lightweight train. On the other hand, if there are numerous stops and slowdowns, the advantage of the lightweight train is multiplied.

Fig. 9 shows tractive-force curves for steam, electric, and Diesel locomotives of equivalent-nominal-horsepower rating. Steam locomotive *E* from previous studies is compared with assumed electric and Diesel locomotives, the continuous motor rating and the Diesel-engine rating being used for the electric and Diesel locomotives, respectively. It is common practice to take advantage of the overload capacity of electric motors while accelerating, which is a distinct advantage for an electric locomotive drawing its power from a trolley; but the Diesel is limited by the capacity of its engine, and the overload possibilities of the steam locomotive are circumscribed by considerations of economy and good practice, at least in the preparation of train schedules. A direct comparison of locomotives having such different characteristics is impossible, but the curves serve to illustrate the relative capacities for accelerating trains. They also demonstrate that the steam locomotive, with moderate improvement, is capable of taking rank with the best motive-power units.

Fig. 10 illustrates an advantage of the improved locomotive with respect to the power output required for acceleration to a given speed. The kinetic energy of two trains of the same weight is the same for any speed; but the improved locomotive requires less time and distance to attain speed and, therefore, the energy required to overcome friction is less. Inasmuch as each locomotive would have to cover the same distance in actual operation, this saving during acceleration is theoretical rather than real.

Design of Maximum Locomotive

Perhaps the greatest handicap of the steam locomotive is the deep-rooted conservatism of American locomotive designers which has sentenced it to be a machine of two cylinders controlled by one valve apiece. The destructive dynamic forces which diverge from the line of power transmission, and the ineffective steam distribution have, it seems, become necessary evils, to be tolerated rather than faced. The author believes that these handicaps can be overcome, while still retaining for the steam locomotive the simplicity and flexibility which are its greatest assets. The maximum locomotive *E* has been assumed as a two-cylinder locomotive, conventional in all respects but valve action; and it seems probable that no satisfactory arrangement of cylinders to eliminate counterbalances and dynamic augments can be developed until a

(*Continued on page 20*)

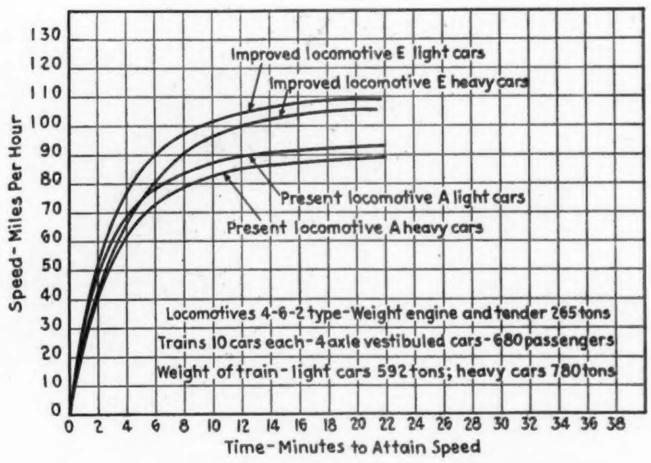


Fig. 8—Effect of car weight on the rate of acceleration

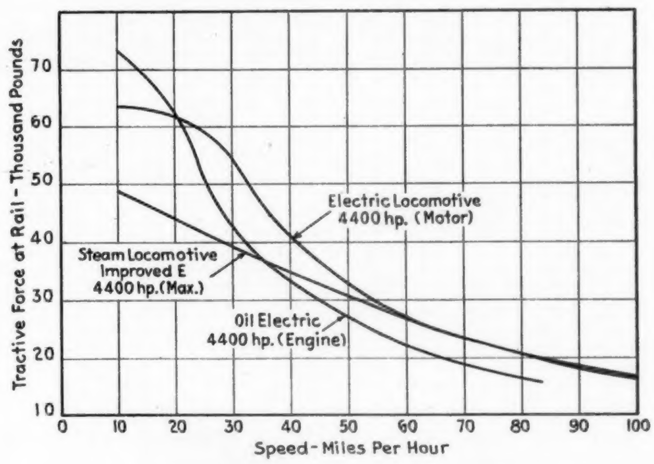


Fig. 9—Tractive force of various locomotives

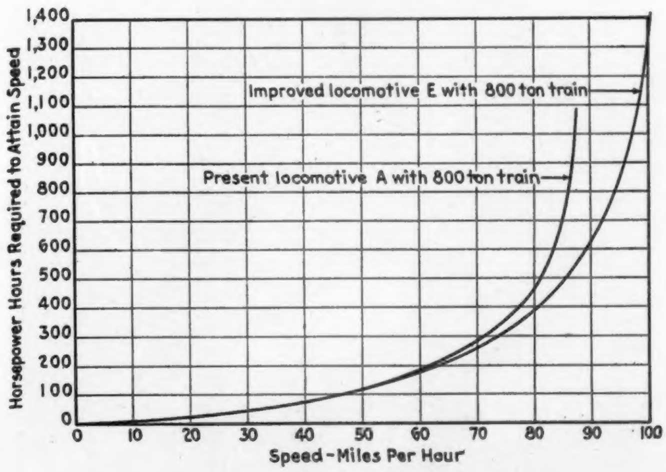


Fig. 10—Horsepower hours versus speed

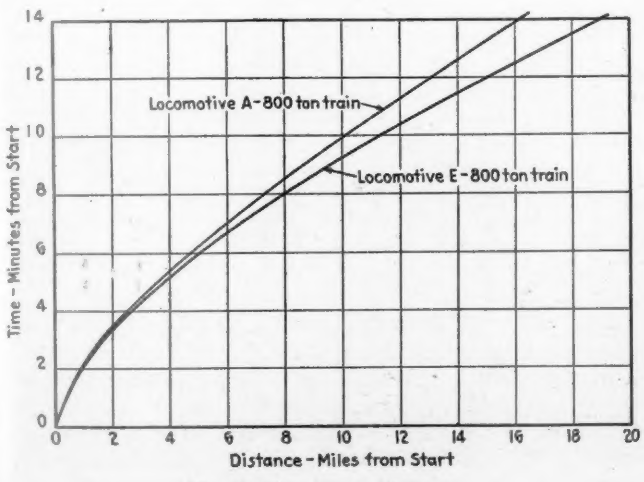


Fig. 7—Time versus distance

The new Santa Fe Diesel locomotive shop at Chicago

Santa Fe

Diesel Locomotive Repair Shop

THE Atchison, Topeka & Santa Fe has recently put in service at its Chicago terminal a shop for the maintenance and repair work on Diesel locomotives which is believed to be the first shop of its kind to be constructed. The Chicago terminal was chosen as the location for this facility since the greater portion of the Diesel locomotives on the Santa Fe operate in through train service between Chicago and Los Angeles, Cal., and layover in Chicago. The Diesel locomotives not running into Chicago can be repaired in shops adjacent to their lay-over terminals. The nearest locomotive repair plant to Chicago is at Fort Madison, Ia., 232 miles distant, and therefore is not available for work on Diesel locomotives.

Heavy electric traction motors are handled with the 10-ton crane hook —A 260-ton Whiting hoist is used to lift and lower the locomotive

Diesel locomotives have been in both road and switch service on the Santa Fe for about five years and the design of this shop is based on the maintenance work that has been found necessary, and that which may be anticipated.

The principal repairs necessary are those in connection with the maintenance of cylinder liners, connecting rods, cylinder heads, valves, pistons, and connecting bearings; also, the replacing of worn wheels and traction motors and their bearings. Other routine maintenance work such as the changing of lubricating oil in crank cases and the cleaning of oil and air filters and similar work is performed in this shop.

The new Diesel shop has been built in connection with other extensive improvements in the Chicago terminal which has involved an addition to the enginehouse, a new power house, a modern coach cleaning yard and other terminal facilities. It was found more desirable and economical to separate Diesel repairs from steam locomotive repairs such as are usually carried on in enginehouses.

The Diesel shop building is of steel frame construction with brick walls and steel sash. Its length is 324 ft. 2 in. and width 111 ft. 6 in. It is comprised of two bays, a high bay or erecting bay having a width center to center of columns of 55 ft. and a height under roof truss of 41 ft. 6 in. The low bay or machine bay is 54 ft. wide and has a minimum height under roof girder of

Removing a Diesel-engine cylinder head

16 ft. A shed roof 69 ft. long and 48 ft. 10 in. wide is built onto the erecting bay over the coach drop pits on the side opposite to the machine bay. This shed is built in such a manner that it can be extended and enclosed to form another bay of the building.

Looking to the further expansion of this facility, footings for building columns have been poured in connection with an adjacent coach-yard building so that yet another bay can be added to the Diesel building and so that all bays can be increased in length about 50 per cent of their present length.

The building is well lighted by ample sash in the outer walls and by A-shape skylights. The floor is of concrete, surfaced with asphaltum blocks in the erecting bay and Kreolite blocks in the machine bay. Ample artificial lighting is made available by including recessed lights in the pits. The heating is by unit heaters.

Pulling out a Diesel engine piston

The erecting bay has two pits

A balanced wheel-lifting frame used at the wheel lathe—Axles are protected with canvas

Machinery in Santa Fe Diesel Locomotive Shop at Chicago

1—42-in. Sellers wheel lathe
1—United States Electric Tool Company 7½-hp. double grinder
1—Small combination buffer and grinder, 3 hp., 3-in. diameter wheels
1—Albright & Nell Company grindstone, 48-in. diameter wheel
1—Monarch 20-in. engine lathe
1—Cincinnati 36-in. heavy-duty shaper
1—No. 2 Kempsmith universal milling machine
1—Sensitive drill press (bench type)
1—Niles Tool Company 5-ft. right-line radial drill
1—American 24-in. engine lathe
1—Magnaflux testing machine, type BS-202
1—Hydraulic press, 3½-in. by 6-in. ram, 18 in. by 18 in. between frame
1—Steam generator safety-control testing device
1—Hobart 400-amp. electric welding machine
1—Autogenous welding and cutting outfit
1—Whiting automatic 6-ft. drop table
1—Whiting 260-ton lift hoist
1—P&H overhead traveling crane equipped with 40-ton and 10-ton hooks
7—Steel work benches equipped with vices, etc.
3—Crankshaft crank-throw grinders
1—Crankshaft main bearing grinder
1—Bacharach Premax piston pressure indicator
Wheel micrometers used in connection with wheel lathe work to keep wheel diameters within two to four thousands tolerance.
Supply of miscellaneous small tools, hand grinders, cylinder hones, micrometers, etc.

Two longitudinal repair tracks extending the length of the erecting bay are laid with concrete jacking blocks outside of rails. Between the rails is a pit approximately four feet deep. Over these repair tracks operates an electric traveling crane having a capacity of 10 tons on a high-speed hook, and 40 tons on the main hook. This is sufficient to lift Diesel engine cabs and the engines and generators or other equipment out of the cabs. The steel of the erecting bay is designed to accommodate an additional crane of the same capacity as the present one.

At the end of one repair pit in the erecting bay is located a Whiting combination coach and locomotive hoist. This hoist is of the four-column type and has a capacity of 260 tons and a variable longitudinal spacing of the lifting pads from 33 ft. to 80 ft. This hoist is of sufficient capacity and is arranged to lift any Diesel or steam locomotive or other piece of equipment which can be run into the Chicago terminal. It is expected that the hoist will be used principally for lifting Diesel locomotive bodies from their trucks, but it also can be employed for lifting locomotives and cars from their wheels. The use of the hoist obviates the necessity of a traveling crane of large capacity and the necessary heavy steel in the building to carry such a crane.

Under the other repair track in the erecting bay is placed a Whiting drop table in a pit. This pit also extends out under two tracks beneath the shed roof along side of the main building. This table is used for dropping wheels with motors from under Diesel locomotives in the erecting bay and for dropping coach wheels on the two tracks outside of the Diesel building.

At one end of the machine bay is located the wheel shop and some machine tools for heavy repair work. The electrical and air-conditioning repair shops are also in this bay and are separated by sash and wire screen enclosures. In one end of the machine bay are ample toilets and wash rooms with locker rooms. It is expected that the machine equipment will be supplemented from time to time as found necessary to meet the demands of repair work.

It is expected that these improved facilities will expedite repairs to Diesel locomotives, thereby increasing their availability and reducing maintenance cost.

Steam Locomotives and Train Acceleration

(*Continued from page 17*)

satisfactory valve action has been perfected. But regardless of the number and arrangement of the cylinders, the mean effective pressure will continue to govern the output; and the following additional assumptions have been made:

(*a*) Minimum pressure drop from boiler to steam chest. The superheater and pipes should afford free passage to the steam, for while steam which expands without doing work is raised in temperature, it is pressure which does the work in the cylinders.

(*b*) Adequate steam-chest volume. The opening of the admission valve results in equalization of pressures in the steam chest and cylinder; and at high speeds the surge of steam pressure from the pipes and header does not reach the steam chest until the valve has closed. The result is a maximum indicator-card pressure far below boiler pressure, and an average admission pressure yet lower. Meantime, the steam entering the chest at high

velocity builds up a surge pressure which may go 50 lb. above boiler pressure at its peak, but drops to normal before the next valve opening. An adequate steam-chest volume is, therefore, essential to hold up the admission line on the indicator card; and also to insure a uniform velocity of steam through the superheater and pipes.

(*c*) Well-designed exhaust passages. The ideal passage would pass the steam to the nozzle at maximum velocity and minimum back pressure; but since both are impossible of attainment in the same passage, a uniform cross section of smooth proportions is desirable. Too large an exhaust passage operates as an expansion chamber which has to be choked at the nozzle to produce draft, with resulting high back pressure against the piston in the center of its stroke, where it is most damaging to the mean effective pressure.

(*d*) Large exhaust nozzle, which is only possible with an efficient front end.

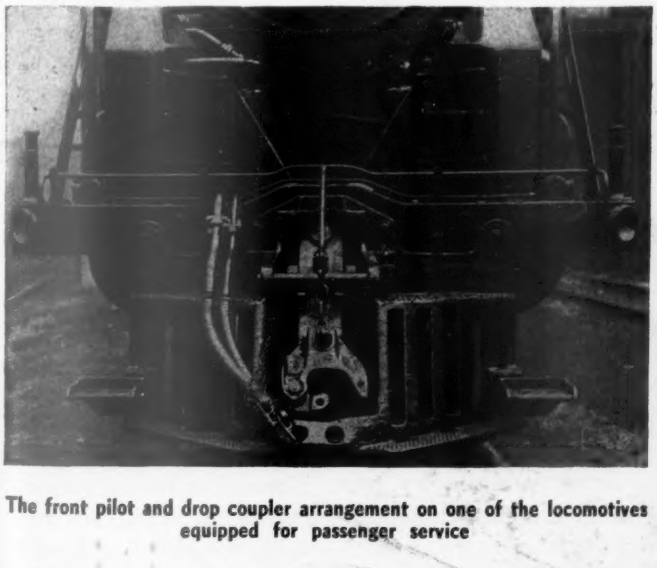
(*e*) Proper steam distribution. This specification eliminates the one-piece reciprocating valve, and requires separate admission and exhaust valves so arranged that cutoff may be shortened without advancing the other valve events. Various valve arrangements which meet this requirement more or less perfectly are extensively used in Europe and we would do well to profit by their experience. Experiments now under way in this country may lead to successful results.

New York Central 4-8-2 Type Locomotives

(*Continued from page 8*)

The tender is a 15,500 gal. riveted tank, with an unusually large coal space, welded to a Commonwealth cast-steel water-botton frame and supported on two six-wheel trucks. The frame and trucks were supplied by the General Steel Castings Corporation.

The trucks are equipped with 41-in. rolled-steel wheels, 6-in. by 12-in. journals and ASF clasp brakes. The brake



The front pilot and drop coupler arrangement on one of the locomotives equipped for passenger service

system is designed for 100 per cent braking with 50 lb. cylinder pressure based on a light tender weight of 158,600 lb.

The coal space has a capacity of 43 tons and is equipped with a modified Type D-A coal pusher. The stoker engine is housed inside the water space on the left side of the tender immediately back of the coal space.

The tenders of all the locomotives have water scoops.

Vertical Wheel Hand Brake

The Champion Brake Corporation has developed a vertical wheel hand brake, called the Micro-Matic safety hand brake, which is operated entirely by the hand wheel. It is being distributed by the Standard Car Sales Company, Inc., Chicago.

After being set, the brakeman effects a reduction in brake shoe pressure simply by turning the hand wheel in the reverse direction, thus reducing the braking effort as much as desired. Additional pressure on the brake shoes can again be secured at any time by turning the hand wheel in a clockwise direction, thus making sure that the brakeman will have accurate control of the braking effort at all times. The hand-wheel remains at whatever position it is turned to, regardless of the brake pressure applied, an important safety factor.

The brake is fast in action, requiring only two and one-half revolutions of the hand wheel to take up the slack and one-half revolution in addition to set the brake from full release position. There are no control levers to operate, eliminating any reason for the brakeman to let go his hold on the car, so this may be accurately referred to as a "one-hand" hand brake.

The brake is ruggedly constructed with relatively few parts, and is equipped like other Champion brakes which have been in service many years, with Oilite bearings having sealed-in-life-time lubrication.

The rim of the hand wheel has a hand grip designed to give a greater purchase for final application of power. It also provides a convenient grip for releasing the unit.

Champion Micro-Matic safety hand brake applied to hopper car

EDITORIALS

The 1940 Index

The index to the yearly issues of the *Railway Mechanical Engineer* is sent only to those subscribers who have asked that their names be placed on our permanent mailing list. Therefore, if you wish the index but have not been receiving it, please let us know promptly.

Plan for the Emergency!

From the beginning of our national defense program expressions of concern have been heard from many sources as to the ability of the railroads to meet the transportation demands imposed by it. Through the Association of American Railroads the nation has been reassured that the railways are ready to meet any demands which may be placed upon them, and, during 1940, every demand was met without visible car shortages. How about 1941?

The total volume of freight transportation for the year 1940 will probably equal, if not slightly exceed, that of 1937. At the present rate of progress the volume of production and transportation created by our defense program will continue to increase for some months and the total transportation volume for 1941 will undoubtedly be still higher than that for last year. But the present rate of progress, it is becoming increasingly evident, is not satisfactory and undoubtedly it will have to be speeded up.

So far, the defense program has been carefully regulated to interfere as little as possible with business as usual. Where possible, contracts for defense materials have been deferred to fill the valleys of normal peacetime production. This effort undoubtedly has influenced the demands on the railroads during the latter part of 1940. Indeed, it may be one of the causes accounting for the fact that in the neighborhood of 400 billion net ton-miles of freight traffic for the year was accompanied by an average carloading for the four highest weeks of 817,000, while for 1939, with 365 billion net ton-miles, the average carloadings for the four highest weeks was 844,000.

No attempt will be made here to estimate the total volume of traffic likely to be produced during the new year. It may be said, however, that an increase over 1940 of 10 per cent is entirely within the realm of probability. Depending upon the effectiveness with which the increasing transportation demands of the defense program are prevented from becoming major factors in the peaks, such a volume of traffic may effect an average carloading during the four highest weeks of the fall somewhere between 900,000 and 1,000,000 cars. If the present effort to arouse the nation to a war psychology in relation to its defense program proves effective, the peak demand may well be nearer the latter than the former figure.

Roughly translating these figures into car needs, it would appear that the railroads will need a minimum of 40,000 more freight cars by next fall than were available during 1940, and they might even need a far larger additional supply than that. It is doubtful, however, whether orders for more than 75,000 to 100,000 cars could be supplied within reasonable delivery dates during the new year—just how many will depend upon the extent to which the national defense program is accelerated.

No claim is made for extreme accuracy in these estimates. We believe, however, that they are sufficiently indicative of the situation now facing the railroads that each road should anticipate its requirements for new equipment, both cars and locomotives, with a considerably longer look ahead than usual and with liberal allowance for the possibility that the acuteness of the situation is going to increase rather than the reverse.

Refinement in Shop Methods Now Demanded

Accuracy of machine work and greater precision in the fitting and assembly of locomotive parts are factors of increasing importance in present-day maintenance work. One need only review many of the papers and discussions at the recent meetings of the mechanical associations at Chicago to realize that the operating conditions brought about by higher speeds and heavier loading are creating problems that can only be solved by a co-operative study of underlying factors and the relation of these factors each to the other.

A case in point is a problem that is giving several roads considerable trouble—that of assuring the proper alignment of locomotives as regards the related parts of frames and running gear. There have been instances where a single locomotive of the same type and class and in the same service in the same territory as several others, will come out of the shop after a complete general overhauling and develop mechanical difficulties necessitating expensive running repairs after a relatively short term of road service while the other locomotives in the same group will go through their assigned mileage without any unusual troubles.

What is the reason for such situations—is it a basic

fault in the design of parts, a question of the necessity for a change in shop methods to meet new conditions or, possibly, a changing set of operating conditions that is giving rise to troubles which have not previously been encountered?

In one shop the alignment of frame and running gear parts are checked individually and after assembly with precision gages. Wheel centers are mounted to gage and tires are set with micrometer gages in three positions 120 degrees apart on each pair of wheels so that the finished job is accurate to thousandths of an inch. The wheels are checked again in the tire turning lathe and after the turning is completed to assure that the plane through the center of the tread or flange is exactly at right angles to the centerline of the axle. All of this checking eliminates any possibility of an inaccurate pair of wheels reaching the erecting floor. Boxes and shoes and wedges are likewise checked before they go to the erecting floor and the same thorough pre-assembly checking is done on the parts and complete assembly of the engine and trailer trucks.

After assembly alignment is checked by lines parallel to the frames on both sides and gages are used to determine the distances to the front and rear diameter points at each wheel and a permanent record is made of all of the important actual dimensions of each locomotive as it leaves the shop.

The important facts that are being developed by the necessity of such precision methods are that better shop and enginehouse inspection methods must constantly be sought; that no tool or gage that will contribute to greater accuracy of machining or assembly can be looked upon as an unnecessary refinement and, most important of all, that the repeated requests of the shop officers for modern and more accurate machine tools and shop equipment must now be given serious consideration if these problems relating to longer-life locomotives are to be solved.

Car Supervisors' Hopes for 1941

What car supervisors (and locomotive supervisors also, for that matter) hope for primarily in the year 1941, is the development of enough traffic and railway earnings so that a reasonable budget of maintenance expenditures may be set up on a monthly basis and continued throughout the year without the wide fluctuations which are so demoralizing to shop forces and, by and large, tend to reduce the standard of equipment maintenance all out of proportion to the savings in payroll expense. Car supervisors, from the head of the department down, will ask no greater favor of 1941 than the ability to anticipate maintenance requirements and operate their respective departments on a basis which will supply an adequate number of cars of the many different types needed to meet the exacting demands of modern shippers and the traveling public, and supply these cars in condition to carry their respective loads to destination quickly and safely.

Car supervisors would, of course, like to have many other things in 1941 aside from uniform shop operation. Many of them would be downright appreciative of a sizable amount of new equipment to replace obsolete and worn out cars, thus reducing the average age of car inventories and enabling railroads to give improved service with less maintenance expense. New machine tools and equipment essential to efficient car-shop operation also are in the same category of a capital expense which would go far to increase the availability and earning capacity of railway car equipment and at the same time reduce unit maintenance costs.

Every car department head watches Account 314—Freight Train Car Repairs and Account 317—Passenger Train Car Repairs and many of them hope that they can keep the former under ¾ cents, and the latter under 2¾ cents a car-mile in 1941. Fervent prayers are being uttered for freedom from train delays and accidents due to equipment failures, particularly under the conditions of modern high-speed operation. Similarly, a favorable record in fewer personal injuries will gladden the hearts of the supervisors, many of whom will be well satisfied if the casualties, including minor injuries, can be reduced to three per million man-hours.

What wouldn't car surpervisors give for fewer hot boxes in 1941, even though present records show figures in some instances of 500,000 miles per hot box in freight service and 1,500,000 miles per hot box in passenger service? Even more than a reduction in the percentage of federal defects found by I. C. C. inspectors, car supervisors would consider it a boon if someone would tell them why their own inspectors cannot discover these defects before the government inspectors do. Car supervisors would like to see a smaller percentage of bad-order cars to revenue cars on line in 1941; reduced claim payments on account of defective equipment; and a smaller-car repair billing in favor of other roads.

Most of these things which car supervisors look forward to in 1941 are hardly in the nature of presents which will be handed to them on a platter. They are in much the same category as presents received by the head of a family at Christmas time from other members of the family who have no independent means of support. Father "pays the bill" and essentially gives the presents to himself. In other words, these highly desirable car-department goals and objectives, which car supervisors would like to see achieved in 1941, will never materialize except by the hard and faithful work of car supervisors, themselves. These men cannot expect to "make their dreams come true" except by intensive efforts in improving every detail of car-department operation and, particularly, instilling in car-department forces a real appreciation of the urgent need for increased efficiency in car maintenance and handling, so that shippers and passengers may be satisfied and railways enabled to expand their service with the attendant employment of more men in every department.

Mechanical Associations Frankly Challenged

The four mechanical associations that met in Chicago last October expected, when they adjourned, to assemble for four-day conventions without exhibits next September. As we understand it, they had already planned their programs on this basis. Since that time, however, it has been decided that only two-day conventions will be held.

Will so short a time suffice? We believe that with *proper planning* and with no time out to visit and study the exhibits, as much can probably be accomplished by most of the associations in two days as was done in four days last October. Obviously, with exhibits a longer period would be advisable. Why do we make this statement and why do we stress *"proper planning"?*

It seems to be more or less generally admitted that the most important and valuable part of these conventions is that devoted to the discussion of the papers. Such discussions ordinarily bring out much additional pertinent information. They also make it possible to establish contacts and friendships that can be followed up to advantage between conventions, when a fellow is facing an unusual problem and wants to know where to turn to compare experiences and find help in solving it.

Why not devote all of the time of the meetings to debate and discussion, thus covering practically as much ground in two days as in four days last year, in those conventions where advance papers were not made available to the membership? It means, of course, that all of the associations would have to preprint the reports and papers early enough so that they could be distributed to the members and be thoroughly digested before the conventions. In this way the time of presenting the report could be cut to, say, ten minutes, the chairman merely attempting to cover the high spots.

Distributing the reports in advance would have another distinct advantage. It is quite noticeable that in most instances the members find difficulty in following and digesting reports when they must depend entirely upon a single reading at the meeting. Much time is therefore lost in correcting misunderstandings and answering questions which would never have been propounded if the members had had time to read the reports carefully in advance. Some of the associations print the reports for the forthcoming meetings in advance, but to have all of them ready early enough so that copies may be placed in the hands of the members in time for study before the meetings, the officers and committee men will have to get extremely busy and do a real job during the next few months.

The Locomotive Maintenance Officers' Association will publish proceedings of the last convention, so that now all four of the associations have published proceedings. This should simplify the problem of printing advance copies of the reports, since in all events the type will have to be set, and little extra cost is involved, except for the paper, printing and mailing charges for the advance copies. These need not necessarily be bound in pamphlet form, as is true in the case of the Master Boiler Makers' Association, but can be sent out in galley form, as has been the custom of the Railway Fuel and Traveling Engineers' Association. It will, however, involve some additional expense. It is quite possible, however, that it can be used as an incentive in building up the membership and interest in the work of the associations.

It will not be an easy matter to get out the reports to the members well in advance of the conventions—nothing really worth while is easy! It can be done, however, if the officers of the associations keep in close touch with the committees and have submitted to them monthly resports of the progress that is being made.

The argument has also been advanced that it would be impossible to present the reports at the meeting in abstract, because not all of those present will have had access to advance copies of the reports and so will not be familiar with them. Why not? Men will hardly attend these meetings without having an invitation or having had advance information about the meeting. Certainly it ought to be possible to bear down hard on this point and see that ample publicity is given to the fact that the papers will be available in advance and must be digested before the members go to the convention. That it is possible to conduct meetings in this way has been proven time and time again by the experience of other organizations.

With only two-day meetings it will hardly be advisable to have general addresses, unless possibly a dinner meeting of the co-ordinated associations could be held on the night of the first day of the conventions. In some instances it may be advisable to have individual technical addresses, in which case, however, these should be prepared and distributed in advance. The speaker could make a brief five or ten-minute presentation of the high spots in the address, and the time ordinarily taken to giving the entire talk could be utilized for open forum purposes, thus helping to develop more clearly and amplify the points made in the printed address.

Obviously the cutting down of the time of the meetings presents a real challenge to the associations. It may, however, prove to be a blessing in disguise if it will force an intensive study of exactly how the conventions should be conducted in order to make the best possible use of every moment of time, and thus insure a maximum practical return from the investment of time and money that is made in these meetings.

Suggestions from those who attended the meetings last October will be found on the next page.

Suggestions for Mechanical Associations

Publicity Between Conventions

I would suggest that in the future you allot some space each month, say a page or less, to these associations to give news and include short comments from the secretaries or individual members as to the activities of the various organizations.

Advance Copies of Reports

Copies of the committee reports should be made up far enough in advance and forwarded to all members of the association, in order that we may digest the recommendations. While it is true we all received a great deal of benefit by receiving the reports at the meetings and having an opportunity to go over them as they were read on the floor, we did not have time enough to analyze them thoroughly and thus insure a profitable discussion.

Use of the "Mike"

While it is desirable, I am not sold on the idea that all of the discussion should be carried on through a "mike." I rather feel that you will lose some discussion for the reason that some will not care to come to the platform. The "mike" is an advantage to a speaker, but if he will take the time to weigh his remarks and speak clearly and slowly, I don't think generally the speaker will have much difficulty in making himself heard.

Concerning the Value of the Meetings

I am very strongly in favor of such mechanical meetings and I think it would be beneficial for the railroads to send supervising officers, including promising junior employees and roundhouse and assistant roundhouse foremen, as well as inspectors, to such meetings, *with instructions, of course, that they must render a report to their superior officer on returning to their headquarters.* I, of course, agree that a certain amount of entertainment is not harmful, but that the employees who are designated by the railroads to attend the meetings, and whose expenses are paid, should be required to attend and, if possible, take part in the discussion of the various papers read. I also think it would be helpful if an invitation was extended to the engineers and firemen and shop employees to attend one or more of the sessions if they desire—at their own expense, of course—as it has been my experience that most of the papers are very helpful; however, a good lively discussion from the floor usually has the effect of bringing out more information than is sometimes contained in the papers.

Larger Participation in Discussions?

Of the several hundred men attending the convention, probably every one had some particular problem on which he needed help. Quite probably there were men sitting in the audience who could supply the answers to these problems, provided the questions were asked. The average member seems to be fearful of going to the rostrum and using the microphone. You may have noted that in the average convention of from 300 to 400 men, not more than from 15 to 25 ever take part in the discussion of the papers and reports. It was suggested at our last convention that the timid ones write out their questions and send them to the platform. The chairman could then pass them on to the author when he had finished the presentation of his paper. Even this device failed miserably in securing the expected results. If you can suggest in your columns some way of overcoming this weakness it will help greatly to promote a healthy exchange of progressive ideas. Moreover, the association and the railroads will profit greatly thereby.

Wants Air Brake Association Back

While attending the conventions of the Air Brake Association and listening to the various papers presented, as well as the interesting discussion of these papers by such members as Clegg, Burton and many others, my understanding of air brake and train handling was greatly benefited. I know of no other way of securing information and hearing discussions on subjects such as above mentioned other than at the Air Brake Association. It is my earnest hope that this association can be revived for the benefit of all those interested in the air brake and train handling subject. More than ever it is my belief that the Air Brake Association should be revived because of the tremendous changes in air brake devices and train handling within the past few years. I am a member of the Locomotive Maintenance Officers' Association; however, I cannot see where I can be benefited enough by the attendance and listening to perhaps one paper on this subject that I am interested in; likewise with the Railway Fuel and Traveling Engineers' Association. At the recent convention only a half day was set aside for air brakes and train handling and naturally these papers must be limited to the understanding of the members of this association and cannot be presented with the necessary details to interest me.

Associations Should Have Publicity Directors

In my opinion each of these associations needs some means for developing a more cohesive status in the interval between annual meetings. Under present conditions, with the exception of the officers and those appointed to committees for some specific service, as for the preparation of reports or papers for the annual meetings, the membership as a whole does not function and becomes aware of what has transpired during the previous twelve-month interval only by attendance at the annual meetings.

Although the national scope of an association prevents the membership from having the personal monthly contact enjoyed by the railway clubs in the various sections of the country, it appears that a valuable measure of monthly contact can be obtained by systematic use of your magazines, which are universally read by all concerned.

In view of this I suggest that each of the associations appoint a "publicity director," whose duty it will be to arrange monthly for the preparation and publication of material in the *Railway Mechanical Engineer,* pertinent to the work of the association. Comments would be invited from the association membership and from other interested railway employees. In my opinion, such a procedure would go a long way toward making each member conscious of membership in a live organization, as well as promoting the prime purpose of the associations, which is the mutual exchange of helpful information assembled by study, experiment and actual practice. Inasmuch as the latter constitute a continuous process, it is reasonable to expect that each organization will have no difficulty in selecting an interesting and worthwhile subject for release each month.

I feel certain that the officers and membership of the four associations recognize the need of closer relationship throughout the year and will be grateful for your assistance in promoting their work.

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Comments from readers on suggestions made in our November, 1940, number for making more effective the efforts of the Mechanical Department Associations.

THE READER'S PAGE

Master Boiler Makers' Accomplishments

TO THE EDITOR:

You ask how the recommendations of the Master Boiler Makers' Association can be made more effective or, in other words, how the ideas as developed at their meetings can be made to "work."

The Master Boiler Makers' Association is not a legislative body and has no executive power to enforce its findings. From personal observation, however, during close to thirty years' affiliation, their findings and recommendations are effective to a greater degree than is generally known. Through the initiative of members and friends recommended practices are adopted, slowly perhaps but none the less surely. One by one as the best practices are selected from among others, they are accepted and put in force without fanfare or notice other than by the parties directly involved.

Because the association is without mandatory power it does not follow that the ideas developed are unheeded by the boilermaking industry. Their "gospel" is gradually accepted by the industry throughout the United States and frequently in foreign countries as well. Scores of instances could be cited where practices were adopted and good dollars saved as a direct result of the activities and recommendations of the Master Boiler Makers' Association. The book of records extending back over the past fifteen or twenty years will reveal many such. Moreover many of their recommendations are included in the federal law. The favor with which the Bureau of Locomotive Inspection views the deliberations of the Master Boiler Makers' Association has been common knowledge these several years and accounts in large measure for the adoption and enforcement of their findings.

Again, once it is demonstrated and proven that a given practice is superior to an existing or proposed practice, every forward-looking boiler supervisor wishes to benefit by the improved method.

Among the practices recommended and generally adopted are the following:

Normalizing of fire-box flanged steel to remove the stresses of flanging. It was demonstrated conclusively that normalizing more than doubled the life of flanged parts, including also back heads, front flue sheets and outside throat sheets.

Thickness of flue sheets is another matter generally influenced as a result of an exhaustive study by the Master Boiler Makers' Association. Prior to that study it was universally held that sheets of ½-in., 9/16-in. or ⅝-in. material were adequate for this service. The Master Boiler Makers' committee demonstrated that ¾-in. and even heavier was preferable, especially for the front head.

The use of flat head taper driven radials was developed on many roads as a direct result of the findings and recommendations of the Master Boiler Makers' Association.

Welding methods have improved and expanded as a result of members pooling their ideas and findings.

Throughout the years I personally have echoed one note of caution that can properly be included here. Members should guard against over-enthusiasm and a tendency to lend endorsement to a development before its merits have been demonstrated beyond reasonable doubt and over a safe and sufficient length of time. Observing this practice the Master Boiler Makers' Association has attained a reputation for accuracy, freedom from exaggeration and a devotion to truth. Methods and practices in an experimental stage have and should be acknowledged as such. It is in this way that we have advanced the prestige of the association and our own qualifications as real master boilermakers.

WM. N. MOORE,
Past-President, Master Boiler Makers' Assn., and General Boiler Foreman, Pere Marquette Railway Company.

North American Brake Association

TO THE EDITOR:

The Fifth Annual Air Brake Repairmen's Conference was recently held at Parsons, Kans. Those attending were air brake repairmen, air brake supervisors, traveling engineers and enginemen. The purpose of the conference was to bring forth the best methods developed for better maintenance of air brakes, which is reflected in better and more expeditious train handling.

The morning sessions were given over to discussions held in the M-K-T assembly room. The afternoon sessions were held in the M-K-T air brake shop, observing and demonstrating the actual detail repairs to various air brake devices. For example, the detail procedure of finishing the slide valve face and seat face to a "super" finish, having the minimum possible frictional resistance. Those attending this conference, including 106 men from roads other than the M-K-T, were given the opportunity to study, in detail, the methods and procedure followed in making repairs to all air brake devices in service on the M-K-T.

The evening sessions were held in the M-K-T assembly room and were devoted to train handling, bringing out methods of controlling freight train slack by brake and throttle operations which do not materially affect the speed of the train, yet prevent shocks, in sags and on curves, thereby materially reducing damage to lading and equipment.

At the conclusion of this four-day conference, it was the consensus of opinion that a brake association should be formed to perpetuate the good work of these conferences with meetings to be held on railroad property at different shop points. To accomplish this, an association was formed and given the name "North American Brake Association." The purpose of this organization is to insure that detail information will always be available to mechanics and enginemen and will not be lost sight of.

It has been decided to hold the first annual meeting on the Frisco Railroad in Springfield, Mo., utilizing its assembly room and shop facilities in the same manner as was done on the M-K-T. The attendance and interest shown at the Parsons meeting clearly demonstrates the men are eager for an association of this kind.

W. E. VERGAN,
Denison, Tex.

Developments in

Flame Cutting of Metals*

New applications of the oxy-acetylene cutting process and the effect of the cutting on the severed metal parts

One of the most noticeable developments in the railroad shops, and in industrial shops as well, is the increasing use of flame-cutting machines. The advantages of mechanically holding, guiding and advancing the torch or blowpipe over the work being cut are rapidly becoming recognized and both stationary and portable cutting machines are coming into increased use in the shops for a wide variety of shape-cutting operations. These machines are capable of making flame cuts with jigsaw flexibility and yet of such high quality and accuracy that they ordinarily require no further finishing. Several types of flame-cutting machines have been developed that are capable of producing cuts of extreme accuracy with their travel guided by templates so that they may be considered practically automatic.

Multiple Cuts

Stationary flame-cutting machines have been developed that are equipped with more than one torch or blowpipe so that two or more parts may be cut at the same time from a centrally controlled or guiding source. Such machines have, in fact, been designed for use with as many as six cutting torches or blowpipes so that any number of identical shapes up to six may be cut simultaneously side by side. In addition, stack cutting has been worked out so that a cutting machine can shape parts from several superimposed plates at the same time. It is now difficult to conceive of any cutting or shaping operation on any ferrous material part that cannot be advantageously and economically cut by the oxy-acetylene process.

The success of stack cutting for the production of duplicate shapes and sections is dependent upon the thorough cleaning of the sheets or plates prior to stacking and the application of clamping or sufficient pressure to hold them together in rigid contact during the cutting operation. The sheets or plates must be cleaned of dirt, mill scale, rust, paint, etc., so that the clamping force can reduce the spacing between the stack plates to a very small amount. For this work C-clamps are generally used of such size and shape as to distribute the clamping pressure uniformly along the line of the cut. In some cases, it is necessary to run a series of welding beads across the edges of the stacked plates and this method is particularly satisfactory when the cut proceeds close to the edges of the plates. With plates properly stacked there is no practical limit to the number that may be cut in one operation, other than considerations of handling, clamping and cutting ranges of the equipment employed. In some instances the use of a top "waster" plate is recommended which can be a piece of scrap material, usually 3/16 in. or 1/4 in. in thickness. This tends to facilitate the cutting of stacks of thin sheets or of work where the cut doubles back on itself and tends to cause overheating at the point of crossing.

There is another important application of flame cutting which is in reality a form of flame machining that has been used for the preparation of plate edges either for caulking or for welding operations. Beveled flame cuts can be made as easily as square cuts by either inclining the tip or by using an angular tip. Grooved-plate-edge preparations are also being accomplished with special nozzles. Such finished cuts are usually made by machine, although for irregular edges hand cutting is often used.

Flame-Cut Holes

The use of flame cutting for drilling or piercing holes through plate or cast members is also being increased as the facility of this method becomes better understood. Probably every one is familiar with the use of the oxygen lance for projecting deep holes through thick billets or castings, but few have realized how this same method can be utilized for the production of straight-sided accurate holes if the nozzle or cutting tip is held rigidly during the piercing operation. For large holes, machine flame cutting can be utilized to perform cuts that are accurate in size and so smooth in contour as to usually not require any subsequent finishing operation.

Flame Gouging

Flame gouging is a new method of using flame cutting for the forming of grooves in the surface of steel plates and forged parts. It is accomplished by using a cutting nozzle designed to deliver a relatively large jet of oxygen at low velocity which is directed and manipulated in such a manner that a smooth accurately defined groove is cut into the surface of the metal. By the use of different nozzles and manipulations, the depth and width of such a groove can be varied over a wide range.

Retaining plates for brake rigging are made by the piled-plate cutting of eight 1/4-in. plates—This operation is usually performed by single blowpipe cutting of piled plates

* Abstract of report presented at the annual meeting of the Master Boiler Makers' Association, October 22-25, 1940, at Chicago by a committee of the International Acetylene Association. This committee was composed of C. W. Obert, chairman, and J. H. Zimmerman, Linde Air Products Co., New York; F. C. Hasse, The Oxweld Railroad Service Co., Chicago; R. F. Helmkamp and A. N. Kugler, Air Reduction Sales Co., New York, and E. A. Randall, Compressed Industrial Gases, Inc., Chicago.

This casing cover plate for a superheater header shape is being cut with a single blowpipe from ½-in. plate—Note the jigsaw flexibility of the cut

Applications of flame gouging extend to such operations as the removing of temporary welds, the cutting of defects out of welded seams, gouging out the root of welded seams, gouging out the root of welded joints for welding in on the reverse side, and other details of plate-edge preparation. It is coming to play a large and effective part in the application of welded repairs and it is applicable for most of the ordinary low-carbon steels that are used in plate and structural work.

An interesting modification of this operation is that known as spot gouging which involves the piercing of a shallow circular depression in the surface of a plate or forging. By proper manipulation, such a spot may be cut very shallow or as deep as may be desired. The nozzle should be held so that the inner cones of the preheat flames are very close to the plate surface at all times during the cut.

Cutting Tolerances

One of the questions that is occasionally raised concerning flame-cutting operations as above outlined is that it is difficult to find such cuts down to close tolerances unless the torch or blowpipe is machine operated. This is, of course, correct as the trueness of the cut is dependent mainly on the steadiness with which the cutting tip is moved along or through the material. It is impossible to expect the same degree of accuracy in a hand-guided cut as would be obtained with a machine guided cut. Those unfamiliar with flame cutting find it difficult to believe that machine-guided cuts can be performed so accurately as to keep within the tolerances of 10 or 15 thousandths of an inch in cross section.

Warping and Buckling

An objection to flame cutting sometimes heard is that plates cut or trimmed along one edge tend to warp and buckle during the cutting operation. Such warping and buckling is, of course, possible under certain conditions if the plate or part requires a heavy cut and is not held rigidly in line by clamping it to a floor plate or other rigid member that will resist expansion and contraction movements of the material. If the plate or part cannot be held rigidly during the cutting operation, the effect of expansion and contraction can be nullified almost completely by making two or more cuts simultaneously or in rapid succession about the neutral axis of the member. This tends to equalize the forces set up and to neutralize their effect.

Plates under ⅜ in. or over ¾ in. in thickness are seldom warped or buckled perceptibly by flame cutting unless they are long and narrow. For splitting long narrow plates or pieces the so-called method of "skip-cutting" is occasionally employed. In this application the cut is made to skip at intervals depending largely on the character of the work, which leaves a series of uncut sections along the line of the cut edge about one inch long. These uncut ligaments hold the material in line until cooled, whereupon they are cut through to separate the cuts. Quenching the cut progressively also has been used effectively on long narrow sections. The same effect can be gained by making several simultaneous cuts with two or more torches or blowpipes, which are moved together along parallel lines. Where unusual accuracy is demanded in the dimensions of flame-cut parts, correction factors must be applied in making the cutting layout, particularly if the plate or part is preheated.

Rivet Cutting

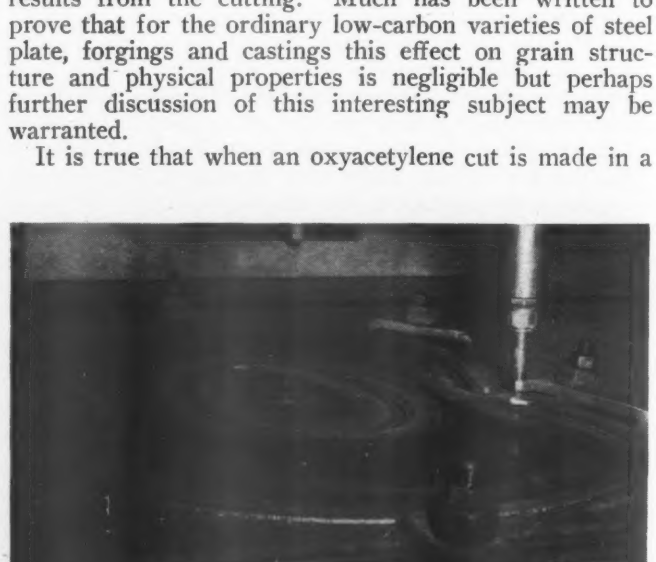
The increasing use of the cutting torch or blowpipe for removing rivets from boiler and car joints or seams is eloquent testimony to the fact that the safety and economy of this operation are becoming appreciated. For this, special cutting tips are used which have large cutting oxygen orifices of the expanding low-pressure, low-velocity type, together with high-intensity preheating flames that cause rapid surface oxidation of the heads of the rivets.

The application of the flame cutting of staybolts is developing commendable interest in the boiler shops. This formerly difficult operation is now performed in very much the same manner as on rivet heads, with great economy of time and effort.

Effect of Flame Cutting on Steel

Reflections are still occasionally heard of the belief that the metal immediately adjacent to the cut edge has been injuriously affected by the localized heating that results from the cutting. Much has been written to prove that for the ordinary low-carbon varieties of steel plate, forgings and castings this effect on grain structure and physical properties is negligible but perhaps further discussion of this interesting subject may be warranted.

It is true that when an oxyacetylene cut is made in a



In making these bottom steam pipe collars ten ¼-in. plates were piled and cut—The 91-in. outside cut was completed in 15½ min., the 33½ in. inside cut in 5½ min.

Injector pipe flanges are formed by the multiple cutting (2 blowpipes) of 1-in. steel plate

steel plate or part, the metal immediately adjacent to the cut is heated considerably above the critical range of the material and immediately thereafter cooled down through this range. The speed of cooling is generally rapid because that heat conductivity of the surrounding metal is high and as the cutting torch or blowpipe is kept constantly in motion, the heating is applied only momentarily at any given point. If the plate or part being cut is not preheated, the cooling is sufficiently rapid actually to cause a chilling or quenching effect on the cut edges, which is particularly noticeable in the case of cutting of heavier plates and forgings.

If any part of a flame-cut edge is carefully polished and etched, microscopical examination thereof will show considerable alteration of the crystalline grain structure of the material immediately adjacent to the cut edge. This change is, however, physical in character and not chemical. The pearlitic structure of the steel will be found to have been transformed into either a sorbitic, troostitic or martensitic form, depending on the carbon content and other elements in the steel. Also, it will be found that there has been an appreciable grain growth at the gas-cut edge. The sorbitic structure that is produced in mild or low-carbon steels is really advantageous as it develops greater strength and toughness and has slightly greater hardness than the original pearlitic structure of the adjacent base metal. Hence, it is universally found that low- and medium-carbon steels are in no way damaged by the flame-cutting operation, but are in effect somewhat improved thereby.

Questions have been raised concerning the effect on welded joints of preparing the welding edges or scarves by flame machining. As a result, there have been several extended investigations to determine whether there is any difference in the physical properties of a welded joint made on scarves so prepared. The net result was evidence that with the reducing atmospheres commonly developed in fusion welds applied with the modern improved processes, the flame-cut edges tend to give a somewhat improved condition in the deposited metal as far as porosity and slag inclusions are concerned. As a result of the published reports on these investigations, various code-making bodies have removed all restrictions pertaining to welding on edges of surfaces that have been prepared by flame cutting, provided the carbon content of the steel does not exceed .35 per cent. In general, machine flame cutting is considered beneficial as compared with other methods of preparing plate edges for welding.

Recently, considerable attention has been devoted to the problem of the effect of flame cutting on the higher-carbon steels and the alloy steels. It is found that the higher-carbon steels can be successfully cut if preheated or subjected to a suitable post-heating treatment. Such treatment may be confined to the affected zone of local torch treatment. The same applies to the various high alloys but little concern is given to the so-called low-alloy steels as most of them perform very much like the low-carbon steels when subjected to flame cutting.

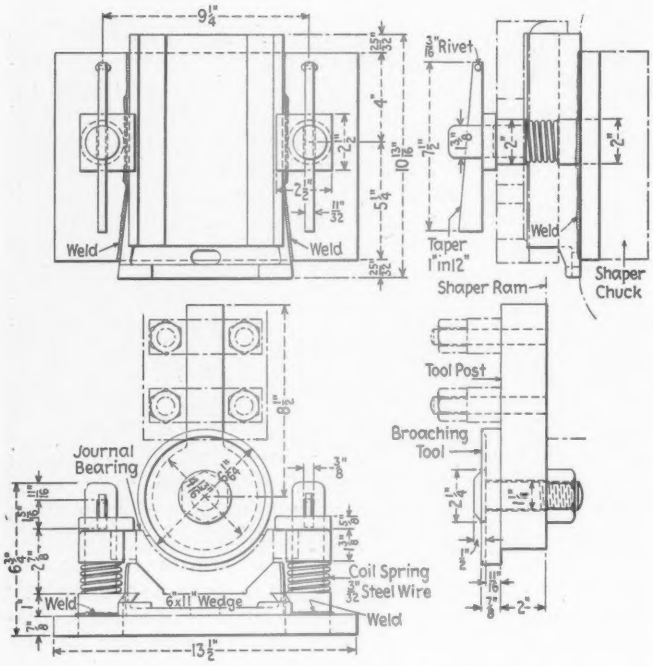
Extensive investigations have been made of the effect of flame cutting on nickel-alloy steel of the customary two per cent nickel variety that have been so extensively used in locomotive boiler construction. With this material the changes caused by the heat of cutting are very similar to those resulting from the flame cutting or ordinary low-carbon boiler plate. The total depth to which the structure is usually altered is .05 in. The grain structure in the nickel steel is much finer adjacent to the cut edge than that resulting in plain carbon steel. There is a band of slightly hardened surface immediately adjacent to the cut edge but this hardness is accompanied by toughness very much the same as the sorbitic structure that occurs in a cut edge in ordinary low-carbon steel. The hardness readings on the cut surface are only a very few points higher in the case of nickel-alloy steel and there was consequently no reason to believe that any different precautions need be taken with this material than with the ordinary low-carbon steels.

Journal Brass Broaching Jig

The illustration shows a car-journal broaching jig which is now being used with good results on the Chicago & Illinois Midland. The particular jig shown is for 6-in. by 11-in. bearings, but similar jigs have been constructed for all standard size journal brasses.

The base of the device is a journal box wedge electrically welded to a heavy steel plate which is machined with lugs to fit on the ways of a shaper or planer bed as well as being machined to fit the jaws of the shaper chuck. The jig and shaper chuck is used only when a few

Broaching jig in use on an American 32-in. crank shaper



Jig used on the C. & I. M. for broaching 6-in. by 11-in. car journal bearings

brasses of each size are to be broached. When this operation is required on any considerable number of brasses, the jig is clamped directly to the shaper table which gives a more rigid base to work from and permits speeding up the operation.

Referring to the drawing, the general construction of this car brass broaching jig will be apparent. The brass, of course, rests on the wedge and is held down by a quick clamping arrangement which consists of two 1⅜-in. round vertical steel posts equipped with square holding washers which have a bearing on each side of the brass and are held down by a taper key and slot in the upper end of each post. As originally constructed, these posts were threaded and equipped with nuts, but, even when free running, this construction was found to slow up the operation and be less satisfactory than the taper key and slot arrangement illustrated.

The broaching tool itself consists of a heat-treated circular steel plate, in this instance 6 1/64 in. in outside diameter, suitably relieved to give a good cutting edge around the entire circumference and mounted on a 1¼-in. machine bolt which is an accurate fit in the tool holder carried by the shaper ram, the shaper used in this instance being an American 32-in. crank shaper. Being circular in shape, the broaching tool may be rotated as soon as one side becomes slightly dull or chipped, and a new cutting surface brought to bear. As many as 800 brasses have been broached without having to resharpen the tool. For quantity production with one size of journal brass the average time required is two minutes per brass.

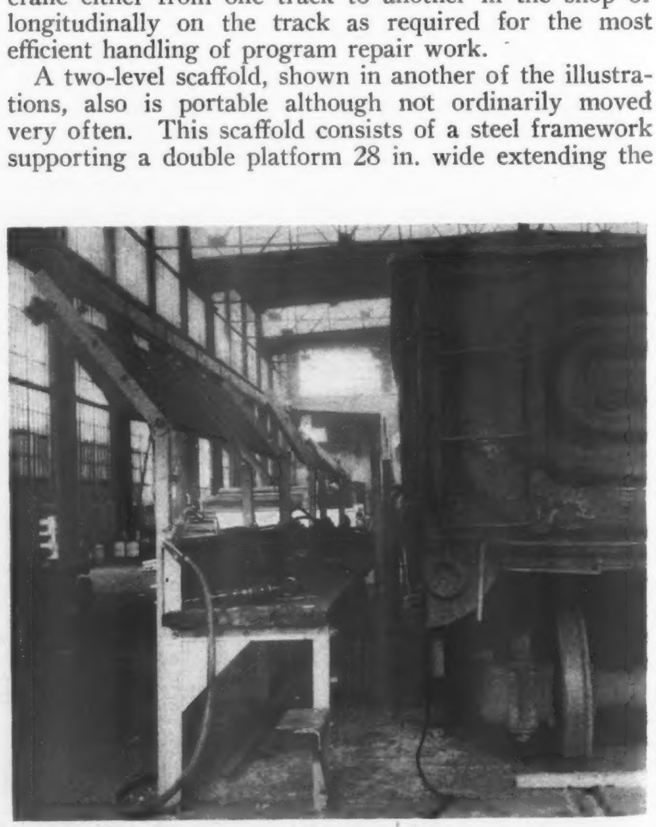
The C. & I. M. has been using this broaching device for more than a year and a careful check of rebroached brasses which are applied only to company-owned equipment shows good mileage and trouble-free service. One important consideration is care in the selection of brasses to be broached. Gages, made in accordance with the A. A. R. Manual of Standard Practices, are used to check all brasses before being broached to make sure that they comply with the A. A. R. requirements. One of these gages is shown lying on the shaper table in the foreground of the photograph. In this view the broaching tool has completed about one-half of its work stroke.

Efficient Scaffolding Used At Monon Car Shops

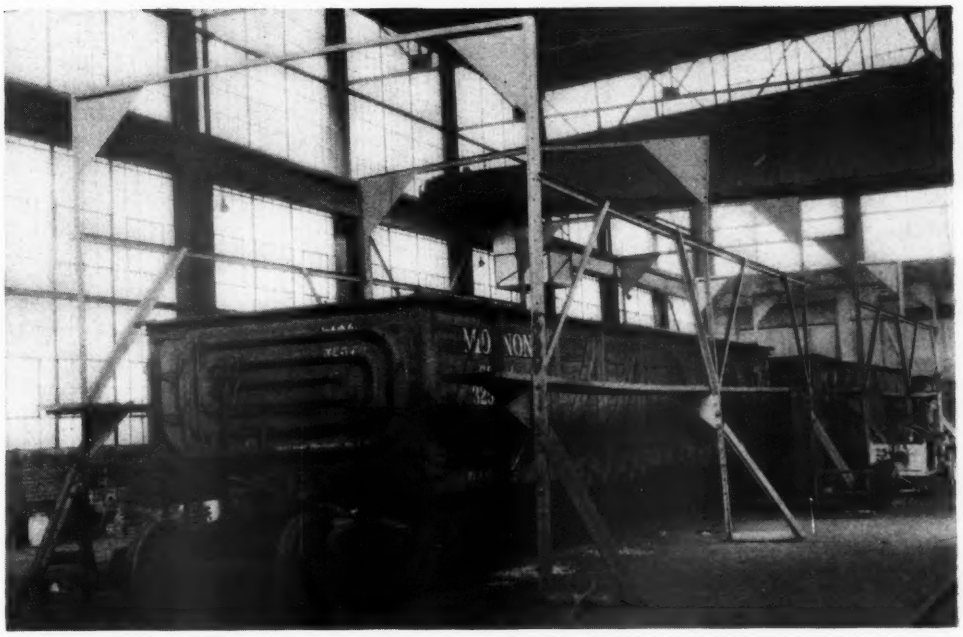
The illustrations show several different types of scaffolds which serve effectively to expedite car maintenance and rebuilding operations at the Lafayette, Ind., freight car shop of the Chicago, Indianapolis & Louisville, or Monon Railway as this road is more familiarly called. The shop itself is a modern steel structure with a large proportion of the wall area devoted to window space which makes for exceptionally good lighting conditions. A 20-ton traveling crane with an auxiliary is available for lifting operations and greatly increases the productive capacity of this shop in which cars are repaired by the progressive system, being moved from one position to another along each shop track, with material, tools and men available at each position to perform the specialized operation assigned to that point. The shop is notable for its cleanliness, good order and the provision of numerous labor-saving devices.

Particular emphasis is placed on the provision of facilities enabling the men to work to the best advantage. The portable adjustable scaffold, shown in one of the illustrations, for example, provides a safe footing at any level desired along the side of any car, regardless of type, whether it is a box car, high-side gondola, or a lower car. The scaffold frame is made of 3-in. Z-bars, the vertical posts on either side of the car having a substantial footing on the shop floor and being tied together with a horizontal bar at the top. The scaffold framework is stiffened with web plates at the upper corners and angular Z-bars elsewhere so as to form a light but rigid flange support for the vertically adjustable brackets and wood platforms. This platform scaffold occupies little floor space and interferes in no way with the excellent lighting conditions throughout the shop. The scaffold may be readily moved by use of the shop crane either from one track to another in the shop or longitudinally on the track as required for the most efficient handling of program repair work.

A two-level scaffold, shown in another of the illustrations, also is portable although not ordinarily moved very often. This scaffold consists of a steel framework supporting a double platform 28 in. wide extending the



Double-deck scaffold with upper deck tipped back so the lower deck may be used



Portable adjustable scaffold used at the Lafayette, Ind., freight-car shop of the Chicago, Indianapolis & Louisville

full length of one car, one platform being 35 in. high and the other 70 in. above the shop floor. The upper wooden platform is bolted to five angle cross bars which are pivoted in vertical extensions of the outer steel frame and may be tipped back out of the way to an angle of about 40 deg. when car men are working on the lower level. When the height of the car side or other condition makes it desirable for carmen to work at the upper level, two men can readily swing the upper platform back to a horizontal position where it is held by extra swing legs and gives a firm footing for work at the higher elevation.

The two-level scaffold is equipped with air connections for the operation of pneumatic tools, as shown in the illustration. A sheet-metal foot plate riveted to one leg of the scaffold gives easy access to the working platform.

The top bulb-angle straightener, shown on the next page, is a simple but effective means of using power supplied by the shop crane to straighten parts such as the top bulb angles of gondola cars, these angles having been bent through the more or less careless use of unloading buckets. The straightener consists of a short section of 75-lb. rail, which bears at one end on the top bulb angle over a side post, has a bolted clevis extending under the bulb angle at the point of maximum deflection and a U-bolt at the other end for attachment to the crane hook. Raising of the crane hook obviously straightens the bend in the bulb angle and the hook is raised until there is a slight upward bend in the bulb angle so that, on the release of pressure, the bulb angle will spring back just enough to bring it straight. Two small steel plates welded to the rail base serve as retainers to keep the end of the rail from slipping off the bulb angle during the straightening operation.

The illustration below shows two 60-lb. rails about 33 ft. long, elevated 26 in. above the shop floor and spaced so as to support freight car trucks which are passing through the shops for repairs or rebuilding. The use of these elevated rails brings the trucks to a height where they can be worked on conveniently by men standing on the floor and performing such operations as applying the side frames and associated parts. Between the tracks, a plank is placed adjacent to each rail to

Raised track which facilitates work at the truck repair position

Device used in straightening the top bulb angle of a gondola car

serve as a footing for operations which must be performed with men standing at that level.

The supports for this truck repair track consist of five welded rail sections as shown in the illustration. The 33-ft. rails are parallel with the shop floor except for 8 ft. at the further end where they are bent down and serve as a runway to permit rolling the trucks to the shop floor by gravity should the shop crane not be available.

Air Brake Questions and Answers

D-22-A Passenger Control Valve (Continued)

625—*Q.—How can the brake rigging be checked for failure to release?* A.—Close the brake-cylinder cut-out cocks and vent the brake-cylinder air to the atmosphere. If the brake-cylinder pistons return to release position, the brake rigging is not at fault. Open the brake cylinder cut-out cocks.

626—*Q.—How would you check for trouble in the relay valve?* A.—If the trouble has not been located in the control valve or brake rigging, it indicates that the difficulty is with the relay valve. A plugged atmospheric vent port leading to the outer face of the inshot diaphragm, or leading to the spaces between the differential diaphragms, may be the cause of failure of the brakes to release. If the vent ports are open, the portion should be removed for further investigation on the standard test rack.

627—*Q.—What is the next test in order?* A.—The service stability test.

628—*Q.—How is this test conducted?* A.—Move the device handle to position No. 1 to recharge the brake pipe and reservoirs to 70 lb. Move the device handle to position No. 5, reducing the brake-pipe pressure 20 lb., then slowly return the handle to position No. 3 (lap). This test must not produce emergency.

629—*Q.—If graduated release is used, what test should be made at this time?* A.—The graduated-release test.

630—*Q.—How is this test made?* A.—Move the device handle to position No. 1 until the brake-pipe pressure has increased 5 to 6 lb., then return the handle to position No. 3 (lap). Repeat the operation several times. At least two graduations should be obtained in this test.

631—*Q.—What is the next test in order?* A.—The emergency test.

632—*Q.—How is this test made?* A.—Move the test-device handle to position No. 1 to recharge the brake pipe and equipment to 70 lb. Move the device handle to lap position for five seconds to determine if the equipment is completely charged. If the brake pipe drops, the reservoirs are not charged to brake-pipe pressure. With the equipment charged to 70 lb., move the device handle to lap position, then open the test-device cock 3/8 in. This test must produce quick action, as indicated by the opening of the vent valve by the time the brake-pipe pressure drops 10 lb.

633—*Q.—In rare instances, what may cause failure to produce quick action?* A.—It may be caused by a decrease in the quick-action chamber volume in the pipe bracket, due to the accumulation of excessive moisture, or it may be due to a restricted quick-action chamber charging choke.

634—*Q.—What test should follow the emergency test?* A.—The release test after the emergency.

635—*Q.—How is this test made?* A.—At the completion of the emergency test, wait approximately one minute before attempting to release in order to permit the vent valve to close. Move the device handle to position No. 1, charging the brake pipe to 15 lb., then move the handle to lap position. Note that the brake-pipe pressure continues to rise, indicating that the emergency piston has moved to accelerated release position. Then move the device handle to position No. 1 until the brake-cylinder pistons move to release position.

636—*Q.—What pressure is developed in the displacement reservoir from a 20-lb. service-rate reduction of brake-pipe pressure from 70 lb.?* A.—50 lb.

637—*Q.—With 50 lb. pressure in the displacement reservoir, what will be the brake-cylinder pressure when the Type B relay valve is installed on a car having the D-22-A control valve?* A.—Approximately 50 lb.

638—*Q.—What will be the brake-cylinder pressure when the A-4-A relay is used?* A.—With the brake rigging designed to produce 25 per cent maximum braking ratio, the brake-cylinder pressure developed from a 20-lb. service-rate brake-pipe reduction will be approximately 30 lb.

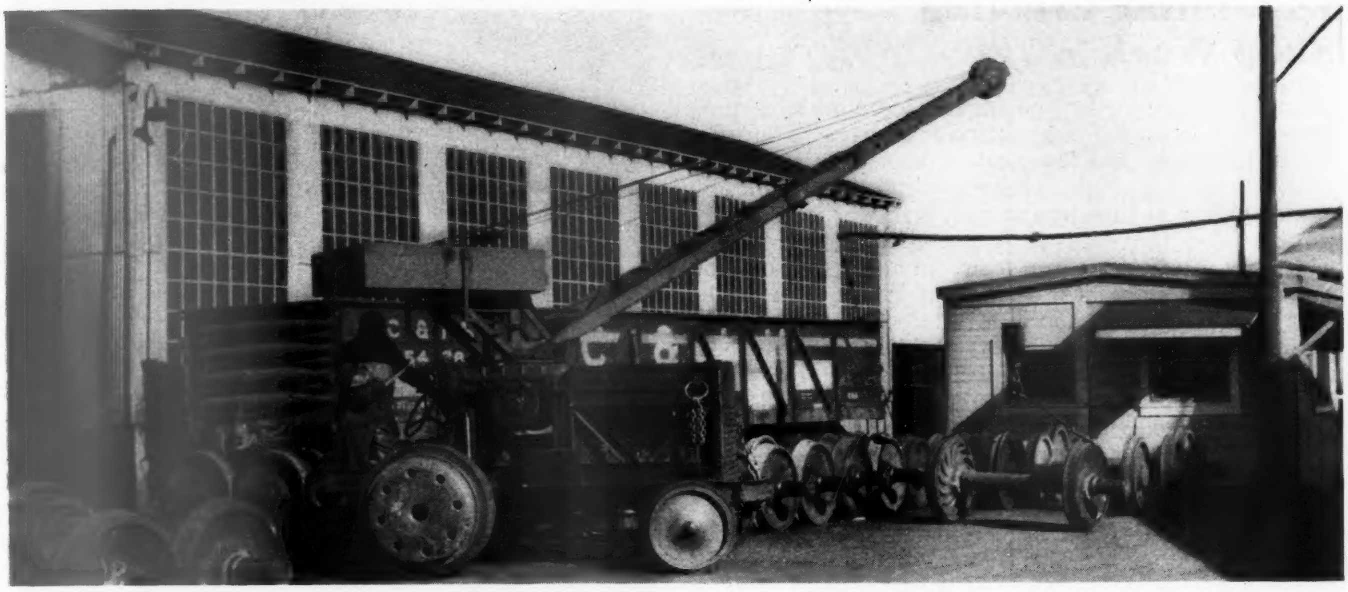
639—*Q.—What brake-cylinder pressure is obtained from an emergency brake application from 110 lb. brake-pipe pressure with the Type B relay valve?* A.—Approximately 95 lb.

640—*Q.—What braking ratio will this brake-cylinder pressure develop?* A.—150 per cent.

641—*Q.—How does this compare with the emergency braking ratio on cars having universal valve equipment?* A.—The maximum braking ratio is the same with both the control valve and the universal valve equipment.

Portable Roustabout Crane

The roustabout crane, manufactured by Hughes-Keenan Co., Mansfield, Ohio, is mounted on a J. I. Case tractor and is now being used effectively in the car department, as well as the locomotive and stores department of the Chicago & Illinois Midland at Taylorville, Ill. Cranes of this type are used for handling car wheels, axles, truck



Hughes-Keenan Roustabout crane in service on the Chicago & Illinois Midland at Taylorville, Ill.

sides and all heavy material on the rip tracks. One of the big advantages is the 18 ft. boom with a 6 ft. extension which is carried on a roller bearing turntable to give greater flexibility and permit transferring material from one position to another without moving the crane at every lift. The weight of the boom is counter-balanced, as shown in the illustration, and the boom may be operated through a complete radius.

The controls of both the speed and lifting of this crane are such that the load or the crane may be operated individually and at either a slow or rapid rate. The crane design permits handling freight-car wheels, for example, through the car yards safely at a speed of 15 m.p.h.

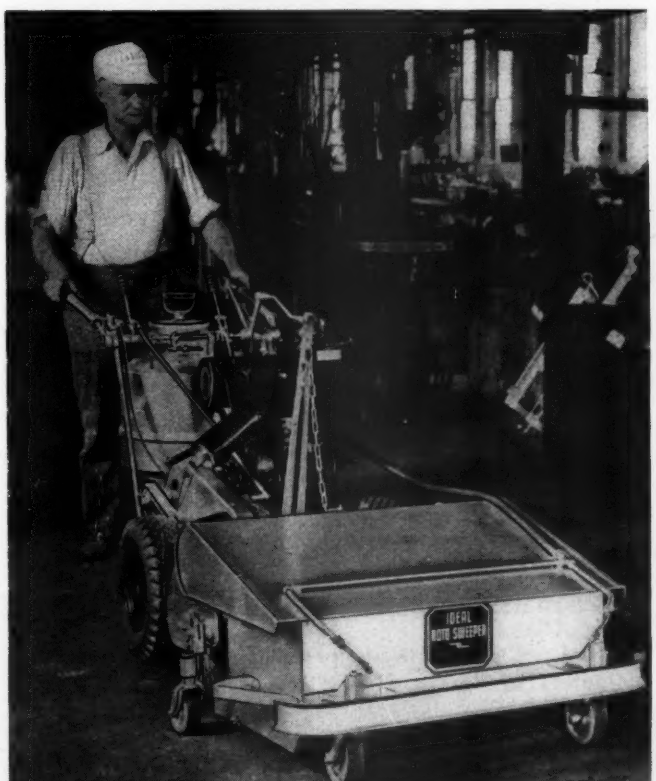
Cranes of this type are available in three sizes, having maximum recommended lifting capacities of 5,000 lb., 8,000 lb. and 10,000 lb. respectively. The larger size machine can lift about one ton at 20 ft. from the center of the turntable.

Power Sweeper for Cleaning Large Floor Areas

The Ideal Roto Sweeper, manufactured by the Ideal Power Lawn Mower Company, Lansing, Mich., will sweep an average of 36,000 sq. ft. of floor surface an hour. It is designed for the inside sweeping of large floor areas in shops and industrial plants, the outside sweeping of docks, platforms and pavements, and for sidewalk snow removal.

This sweeper works equally well on concrete, wood, tile, brick or asphalt. It will pick up both light and heavy sweepings of dirt, dust, sand, gravel, iron filings, borings, cinders, paper and commercial sweeping compound. A sprinkler, regulated to keep the fiber bristles of the brush moist, prevents the raising of any objectionable amount of dust. Where the cleaning problem includes the removal of hard grease, the sweeper can be equipped with a steel wire brush which cuts the grease and deposits it in the dirt box.

The sweeper is equipped with a power-driven brush, 14 in. in diameter, having special fiber bristles. The brush turns at the proper speed in a counterclockwise direction to pick up the sweepings and carry them over a rubber deflector into the dirt box. The machine may be furnished with either the straight or angle type brushes which are interchangeable and can be used on the same



The Ideal Roto Sweeper picks up both light and heavy sweepings —It can be equipped with a steel wire brush for removing hard grease

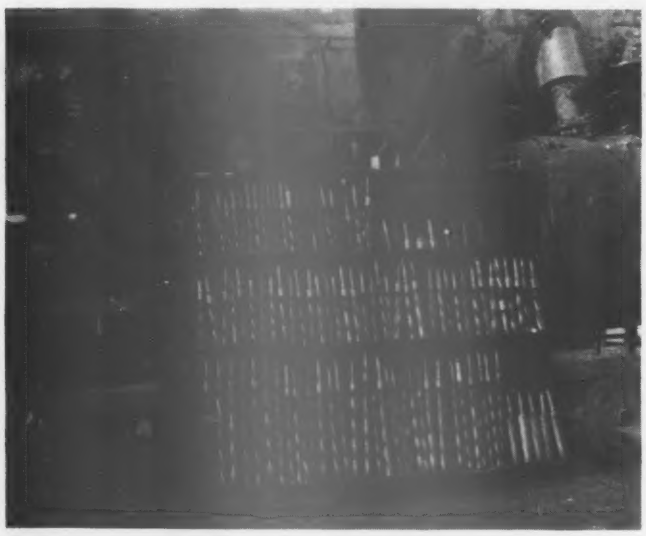
unit as desired. Where there are long stretches of straight sweeping, a riding trailer for the operator adds materially to the usefulness of the equipment.

Expediting Erecting Shop Work

Every effort is made to expedite locomotive erecting shop work at the Chicago, Indianapolis & Louisville shops, Lafayette, Ind., by locating both tools and materials, whenever possible, where they can be secured with minimum loss of time by the shop men who need to use them. Take, for example, locomotive frame reamers, which are usually kept in a toolroom and issued only on check. These reamers are kept out in the open at the Lafayette locomotive shop in a rack located in the erecting shop immediately adjacent to the pits where locomotive frame bolts are fitted. The other side of this rack, shown in one of the illustrations, is used for drills, and various other tools necessary in erecting shop work are suspended from hooks or pins in the ends of the rack.

Whenever a machinist and his helper, therefore, needs to ream a frame-bolt hole, it requires only a few steps to secure the necessary reamer, perform the operation and return the reamer to the rack without the necessity of going all the way to the tool room, possibly waiting in line for issuance of the reamer and subsequently returning it in order to get the brass check which has been left at the tool room and covers the issuance of this tool.

Shop foremen are responsible for seeing that all tools are returned to the racks at the end of each day's work and a glance at the rack indicates whether or not this has been done. A little extra attention is required when first inaugurating this method of dispensing small tools, but, in a shop the size of the one at Lafayette, experience seems to show that the formality of supplying small tools from a central tool room may be dispensed with at least for tools such as frame drills, special wrenches, and reamers without losing the tools and with general benefit to the shop production.



Small tool rack conveniently located in the erecting shop where the tools are used

A compact and substantial work bench, equipped with vices, is also located near the end of each pit, with the same object of saving the time of erecting shop men in the performance of various detailed operations which require the firm support and holding of various locomotive parts while being filed or fitted. One of these work benches, designated by the figure 4, is shown at the left in the illustration. A feature of this bench is that the underneath part is closed and cannot be used for the storage of either tools or materials which must therefore be kept in the open where they can be readily seen and hence available for use when needed. One floating or portable bench is also available and is moved by the crane to any location when needed, and after use is removed to clear the floor.

Cotters are also conveniently available in partitioned shelves in a building column at the wheeling pit

As in the case of small tools, certain materials and supplies, generally required for the repair of all locomotives, are kept in the erecting shop immediately adjacent to the pits where they will be used, to save time formerly required in locating the shop foreman, getting an order, and going to the storeroom for the material. For example, all sizes of cotters used at the wheeling pit are kept on partitioned shelves made of light-gage sheet metal and welded in between the web and flanges of the steel building column immediately ahead of the wheeling pit.

This is a neat arrangement which takes advantage of hitherto unused space and not only saves the time of men working at this pit but actually saves material as well, since, with all the cotters they need immediately available, the men are not tempted to order more than will be required from the storeroom and hence possibly waste some of them. The sign at the top of this column "Help to Keep Your Shop Clean and Safe" is significant of the general conditions maintained at the Lafayette shop, which is notably clean and well picked up.

Cans are provided for waste materials of all kinds, as shown at the right of the column, and the provision of a generally clean shop assures both safety and increased production over what would otherwise be obtainable.

Gage for Checking Wheel Quartering

This shop-built gage takes all the guess work out of mounting wheels on the true quarter and provides an accurate check when wheels are suspected of being out of quarter.

The blade of this tool is a 24-in. heavy-duty Brown and Sharpe steel scale. The measuring device is part of a bevel protractor. This is fastened to the blade with two small thumb nuts on the back of the gage using copper washers between the nut and the scale to prevent marring the scale and is readily adjustable.

When using this tool to line up new or rebored wheels a sliding point on each side of the protractor is used. The protractor is set at 45 deg. and a temporary center is located in both the axle fit and the crank pin fit. The centers of the gage are then set to this distance. The wheel center is placed on the end of the axle in approximate position and the gage held in the centers. The wheel center is moved one way or the other until the bubble of the level attached to the protractor is centered. The wheel center is now in its proper position and it is blocked there. The same procedure is carried out on the other wheel and the keyways are scribed ready for machining. Obviously the pins must be 90 deg. apart.

When checking mounted wheels with the crank pins already in place, a centering head is put on the scale in place of one of the center points and over the other point is slipped a ball of sufficient diameter to fit in the axle center. The gage is held in position as shown and the level moved until the bubble centers. A reading of the protractor is then taken and the same method followed on the opposite driving wheel. If the wheels are properly quartered, the combined protractor readings will be exactly 90 deg. If it is not exactly 90 deg., it shows that the wheels are out of quarter and how much.

Method of using wheel quartering gage to check mounted wheels

Milwaukee Locomotive Shop Methods and Devices

At the Milwaukee, Wis., locomotive shops of the Chicago, Milwaukee, St. Paul & Pacific, a number of methods, devices and new shop tools have been developed or installed to expedite locomotive repair work and reduce the important items of maintenance cost and out-of-service time. The total investment involved in these labor-saving devices and new shop tools is small as compared with the economies effected.

Typical of the shop practices which reduce locomotive maintenance cost and out-of-service time is the welding of back cylinder heads to cylinders, using the method shown in Fig. 1. A leaky back cylinder head is "bad news" at any enginehouse, for it means pulling a piston, removing the main rod, crosshead, guides and cylinder head, providing a new cylinder head bearing surface (probably ground in by hand or by machine to make a steam-tight joint on the cylinder), and all parts then being re-assembled in the machine. Quite a number of man-hours of labor are involved in all of these various operations, during which the locomotive must be held out of service and there is always a possibility that the leak may develop again at some future date.

Fig. 1—Method of welding the back head to the cylinder of a locomotive at Milwaukee shops

In order to make a permanent repair job with every assurance of preventing steam leaks at this point throughout the life of the locomotive, the Milwaukee is now following, as more or less standard practice, the welding of back cylinder heads to locomotive steam cylinders. When a locomotive comes to the shop for heavy repairs, the motion work, the guides and back-cylinder-head nuts are removed. The old studs are then cut off flush with the cylinder head, usually with an

Fig. 2—One of the new J. & L. 2½-in. turret lathes used in machining engine bolts from bar stock

oxy-acetylene cutting torch. Each cylinder (working separately on one side of the locomotive at a time), is pre-heated with a charcoal or briquet fire. The studs are then welded to the cast-steel cylinder head by the electric-arc method, enough metal being deposited on the head of each stud to develop the full holding power of the stud. Bronze welding is used to fill in the space between the cylinder and the cast-steel cylinder head and make a positively steam-tight joint, the electric welded studs simply giving ample reserve of holding power to keep the cylinder head rigidly in place. On completion of the welding operation, the cylinder is kept covered and the fire permitted to go out, the cylinder cooling off in a period of 8 to 10 hr. The direct labor for this welding job is supplied by two welders, who spell each other over an 8-hr. period. About 30 to 40 lb. of bronze are required for the welding on each cylinder head.

In Fig. 2 is shown one of two 2½-in. J. & L. turret lathes recently installed at Milwaukee shops, which are giving good results with Vascoloy cutting tools in machining all kinds of engine bolts, both straight and taper, direct from bar stock for system shop and enginehouse work. The 18-in. taper attachment used on this high-production machine is very convenient and enables adjustments to be made quickly. A third 3-in. J. & L. machine is used on brass bushings and motion-work pins, taking the place of two engine lathes. For this work, a surface speed of 500 ft. per min. or better is practicable when sintered carbide cutting tools are used.

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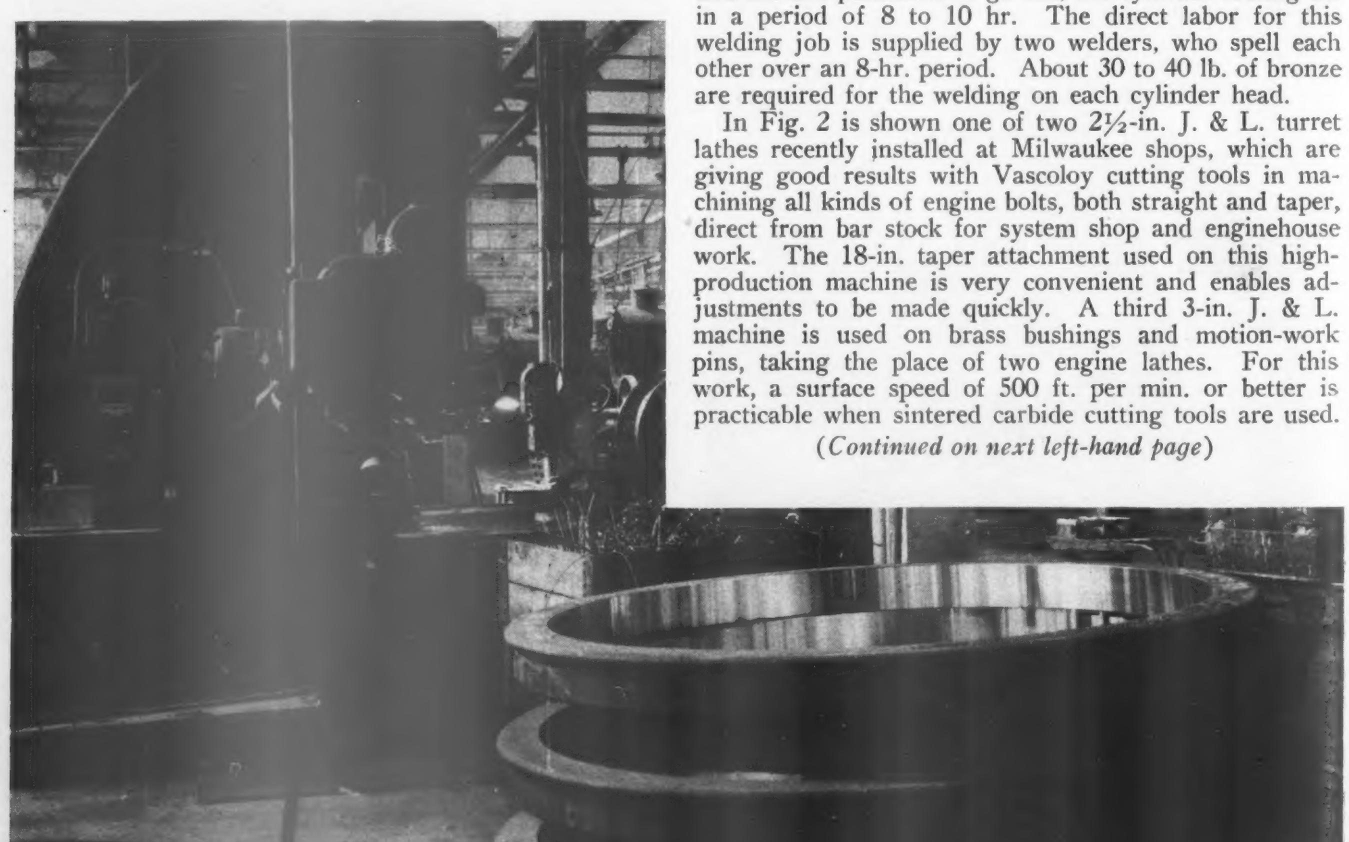


Fig. 3—Betts 100-in. heavy-duty boring mill—The set of tires in the foreground was bored with sintered-carbide cutting tools

The Betts 100-in. vertical boring mill, illustrated in Fig. 3, is a comparatively new machine tool installed at the Milwaukee shops, which has given a good account of itself for all heavy-duty boring operations. On account of the rigidity of the machine and its design for the use of high cutting speeds when necessary, the machine has proved its value for boring locomotive driving-wheel tires in what has come to be the accepted modern practice, namely, by the use of cutting tools of the cintered carbide type with high surface speeds. In this instance, two Vascoloy-Ramet cintered-carbide tools, one for roughing and one finishing, are used simultaneously, one in each head of the boring mill to finish the bore of the tire at one operation. While higher speeds are sometimes used, experience at this shop indicates that a surface speed of about 180 ft. per min. gives the best results over a period of time, the depth of cut varying from .125 to .250 in., and the feed from .025 in. to .032 in. At higher speeds the cutting tools will not hold up. The boring time complete is 22 min. per tire and the setup time 5 min. The highly polished surface on the set of finished tires, shown in the foreground of the illustration, indicates the exceptionally smooth job done in this boring operation.

Fig. 4—Chilled spots are cast on the inner surface of an inside smoke-stack extension to prevent cinder cutting

Another interesting method of securing increased service life for a locomotive part subject to rapid wear by the action of exhaust steam and cinder abrasion, is shown in Fig. 4. The inside smoke stack extension, illustrated, is a type used with the Anderson front end, which has no netting but depends upon setting up a swirling action of the exhaust gases to break up the cinders against suitable vanes, and thus prevent any sparks leaving the stack. The downward-projecting smoke stack extension in the front end is subject to quite severe erosive action and, to secure greater life for this inside stack, which is made of cast iron, 1-in. by 4-in. chillers are set equally spaced and at a slight angle to the axis on the inner surface, which therefore has 1-in. by 4-in. chilled spots all around the interior of the casting and hence retards the wear due to cinder cutting. The chillers are omitted from a band at the top of the stack which must be machined to fit the smoke stack base and have a lip, as shown in the illustration, which permits the casting to be supported from the stack base.

Locomotive Boiler Questions and Answers

By George M. Davies

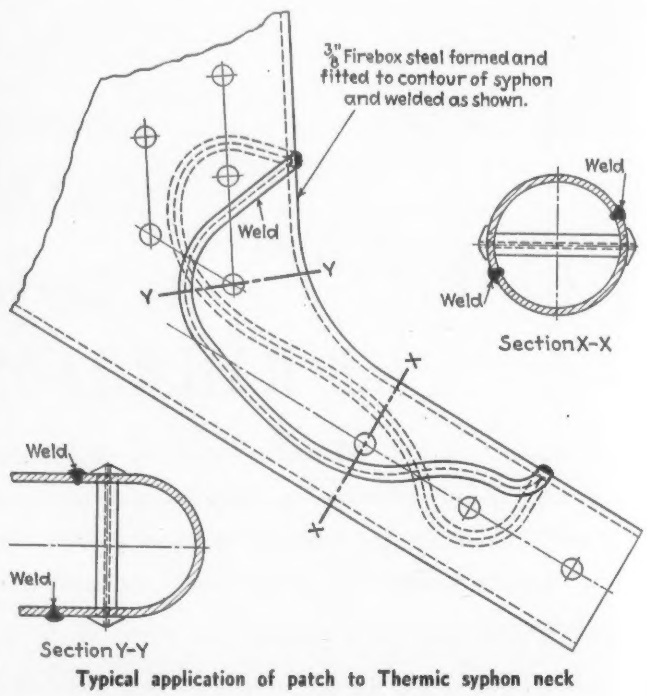
(This department is for the help of those who desire assistance on locomotive boiler problems. Inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless special permission is given to do so. Our readers in the boiler shop are invited to submit their problems for solution.)

Design and Application of Thermic Syphon Patches

Q.—We have had several of our thermic syphons crack in the top of the syphon neck. Is it satisfactory to weld these cracks or should they be patched? What type of patch should be used?—M. I. T.

A.—Circumferential cracks in the top of the neck of a syphon should not be welded but should be patched. The diagram illustrates a typical patch for the neck of a syphon.

The cracked section of the syphon neck is removed by use of an acetylene torch. The cut should be made so that in welding the patch to the old section, the welds are not opposite each other. The patch should, where



Typical application of patch to Thermic syphon neck

possible, be made in a saw-tooth manner, alternating the so-called teeth in order that the staybolts will be in a section of the patch on one side and in an old section of the syphon on the opposite side, as shown in the illustration. The patch should be formed to the contour of the section removed and butt welded in place. Lap welds should not be used to avoid fire cracks due to double thickness of metal.

Repairing Cracks in Firebox Side Sheets

Q.—Several cracks have developed in the firebox side sheets of our Mikado type locomotives. These cracks extend from

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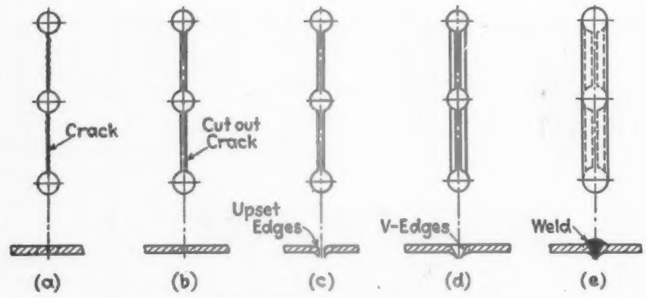

Welding cracks in firebox side sheets

staybolt hole to staybolt hole. Is it unsatisfactory to vee out and weld the cracks or should the area around the cracks be removed and a patch applied?—M. K. O.

A.—When a crack in the firebox side sheets extends from staybolt hole to staybolt hole, it is satisfactory to weld it provided the crack is in a straight line and in no case shall any crack so welded extend more than two staybolt holes as illustrated in Fig. 1 (a). If the crack extends more than two holes or if there are other cracks adjacent to it a patch should be used.

The general practice for repairing a crack in the firebox sheets is as follows: Cut out the crack with an acetylene torch as illustrated in (b), making the smallest cut possible. Then upset edges of plate (c), driving the plates in from the fire side of the sheets, forming a V-shaped opening as shown in (d). Weld the entire opening including the staybolt holes as in (d) and redrill and tap for the staybolts.

Effect of Boiler Pressure On Leaking Staybolts

Q.—What causes fireboxes that are tight in service to show leaks around staybolt heads when cooled down below working pressure?—P. A. T.

A.—Leaks around staybolt heads when cooled down below working pressure are primarily due to the expansion and contraction of the boiler. Other factors are scale resulting from the use of impure water, improper firing, and improperly fitted staybolts.

The staybolts work in the sheets because the expansion of the firebox sheet is greater than that of the wrapper sheet, causing a greater movement of the firebox sheet as compared to the wrapper sheet. A staybolt may be tight before the boiler is heated and show no signs of leaking while the boiler is fired up and under pressure although the staybolt fit in the sheet has been broken due to the sheets working. The action of the sheets due to expansion keeps the staybolts tight. However, when the boiler is cooled down an opposite action takes place. The sheets contract which relieves the pressure on the staybolt fit in the sheet, allowing the bolt to leak.

Whiting Pitless Locomotive Hoist

A pitless locomotive hoist which can be supplied with either four or six jacks, each of which can be separately racked on a narrow-gage track at ground level, has been developed by the Whiting Corporation, Harvey, Ill. The hoists range in capacity from 200 to 250 tons with four jacks and from 300 to 400 tons where six jacks are used. The jacks run on narrow-gage tracks at ground level—a track for each side of the locomotive. Since all of the jacks are movable, close spotting of the locomotive is not required.

Another novel feature is the vertically placed geared-head motor located at the top of each jack, thus providing an individual drive through a pinion and gear. The revolving hoisting screw attached to the gear raises and lowers the hoisting-screw nut—one for each jack, operating in pairs. A pair of these nuts support a lifting beam which, when lowered, passes through a gap in the truck portion of the jack and enters slots in the foundation. In the low position, the beam rests on its foundation with rails on its top side coincide with the locomotive track rails—thus forming a bridge across the slots. As in the past, different slots are used, properly spaced apart for different lengths of locomotives. Slots, not in use, are spanned by removable crossover rails.

With an individual drive as described, there is saved the cost of two jack pits, two shaft pits and a motor pit. All cross and main shafting are eliminated with their numerous bearings and shaft carriages. Because of no pits, no removable pit planks are necessary. With the use of this individual drive, all clutches for the jacks are eliminated, and it is possible to obtain a higher hoisting speed than used in the past.

The control itself is interesting. Each jack has a two-button control—one for "Up" and one for "Down" movements. In addition each jack has a selector switch for making the jack "Operative" or "Inoperative." There is also a pendant detachable master switch that may be plugged in on either side of the hoist. It is thus possible to operate each jack individually, in pairs, or all jacks at one time.


Manufacturer's shop view of two of the three pairs of Whiting jacks which will be installed as a 300-ton pitless locomotive hoist on the Western Maryland at Hagerstown, Md.

The jacks have low and high limit switches. The lifting beam that is the highest during raising movement rings a bell before reaching the extreme high limit. When high limit is reached, hoisting movements cease for all lifting beams. Most of the wiring is located in conduits. Only enough remains outside to make possible

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the movement of the jacks from minimum to maximum travels.

The shop view accompanying this article shows two of the three pairs of jacks constructed for a six-jack, 300-ton locomotive hoist, purchased by the Western Maryland for use at Hagerstown, Md. Each jack has a 10-hp. motor, and heavy power will be raised on the hoist for wheeling and unwheeling purposes.

Metal-Sprayed Parts Finished with Carboloy Tools

Many worn locomotive parts that would normally be scrapped are being reclaimed by spraying these parts with stainless steel and re-machining them to size. Other items reconditioned by this process include such parts as shafts, water-pump piston rods and motor armature shafts.

In practice, 18-8 stainless steel in wire form is fed into the back of a gun equipped with an air turbine supplying power to two knurled rolls which force the wire through the gun into the center of a neutral oxy-acetylene flame. By the careful adjustment of the speed of the wire through this flame, a fine atomization and even deposition of the metal on the worn parts is obtained. All surfaces to be sprayed are sand blasted

The pump rod after being sprayed with stainless steel is being re-finished to size with a Carboloy tool at a cutting speed of 242 ft. per min.

first, using a 30-mesh steel angular grit. This operation not only cleans but also roughens the surface and enables the sprayed metal to adhere to it. The part is sprayed until the size of the part is $\frac{1}{64}$ in. to $\frac{1}{32}$ in. in excess of that to which it is to be machined.

To obtain a fine finish, it was found desirable to turn the sprayed-metal surfaces at high speeds, 200 to 450 ft. per min., using a slow feed and producing fine cuts. For turning operations, Carboloy tools produce good results. On parts that can not be turned, the surfaces are finished by grinding.

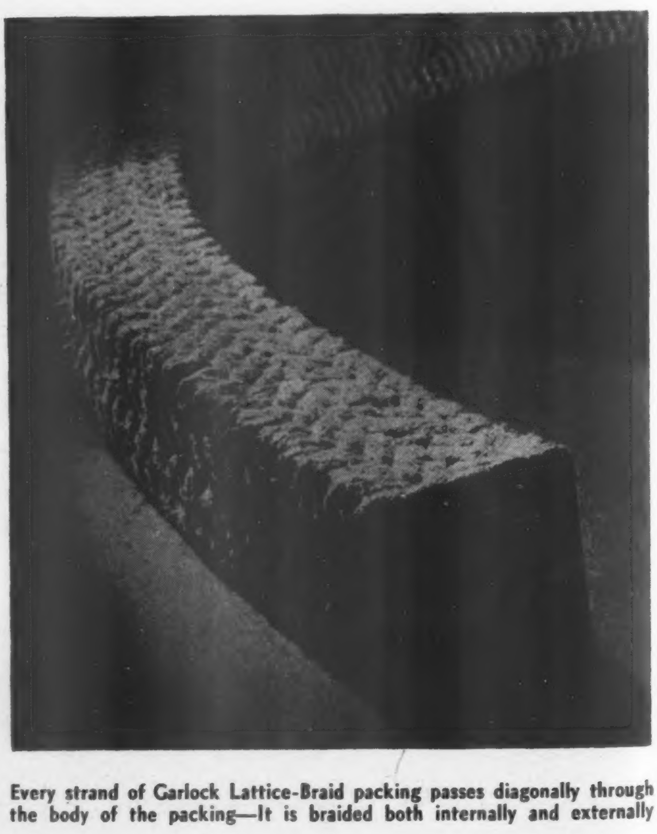
The accompanying illustration shows a pump rod being re-machined after having been sprayed with stainless steel. The cutting speed for this job was 242 ft. per min. with a .005-in. feed and a $\frac{1}{64}$-in. depth of cut. The floor-to-floor time for the $1\frac{3}{4}$-in. diameter shaft, two feet long, was 20 minutes, with approximately 12 pieces being machined per grind of the Carboloy tool. These tools are a product of the Carboloy Company, Inc., Detroit, Mich.

Packing of Braided Construction

The introduction of Garlock Lattice-Braid packings brings to industry an entirely new line of braided packing materials and is the result of many years of experimental and developmental work. In this packing, every braiding strand passes diagonally through the body of the packing at an angle of approximately 45 deg. This makes a completely uniform structure. It is braided internally as well as externally. There are no strands in the packing which are not part of and integral with the entire body of the packing. Structurally, every braiding strand contributes to the strength of the entire mass.

In service, all packings are subject to wear on the surface which contacts the moving rod. Eventually, the strands of braided packing on the working surface will wear through. When this occurs ordinary braided packings will go to pieces because the structure of the packing itself is destroyed. With Lattice-Braid packings, this can not occur because when this packing becomes worn it will not disintegrate into a series of loose strands or separate parts.

Large sizes of this packing can be formed into rings around rods of small diameter without distortion to packing due to the fact that every braiding strand passes diagonally through the packing. This packing is made of materials and in sizes to meet the requirements of all types of applications. It is a product of the Garlock Packing Company, Palmyra, N. Y.



Every strand of Garlock Lattice-Braid packing passes diagonally through the body of the packing—It is braided both internally and externally

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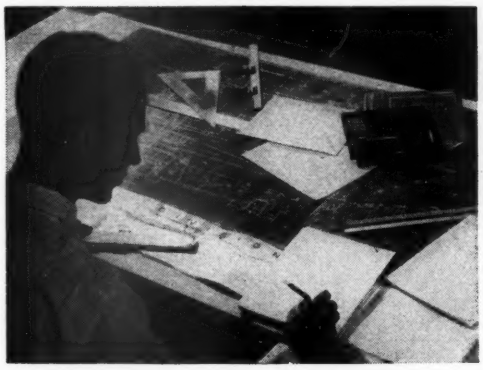

"Tailor Made"

YET STANDARDIZED!

Each Security Arch is "tailor made" to suit the individual class of power in which it must function. But so effectively is Security Arch Brick standardized that only six different Security Brick patterns are needed for more than 50% of the Security Arch Brick used.

This high standardization reflects the engineering and experience of the American Arch Company.

It simplifies the application of the brick arch and saves the stores department a vast amount of trouble.

This foresight of the American Arch Company in adhering to standards is but one of the many ways in which the American Arch Company is serving the railroads.

There's More to
SECURITY ARCHES
Than Just Brick

HARBISON-WALKER REFRACTORIES CO.

Refractory Specialists

AMERICAN ARCH CO.
INCORPORATED
60 EAST 42nd STREET, NEW YORK, N. Y.

Locomotive Combustion Specialists

High Spots in

Railway Affairs . . .

Public Aids To Transportation

The Association of American Railroads has just issued a carefully prepared report of 214 pages, replying to the report on Public Aids to Transportation, which was prepared under the direction of Federal Co-ordinator of Transportation J. B. Eastman, but was not finally issued until 1940—four years after the Co-ordinator's office had been abolished. The preparation of Co-ordinator Eastman's report was expensive, much of the cost being assessed against the railroads. "The railroads," says the A. A. R. report, "have felt impelled in the protection of their interests and to make available an accurate and comprehensive statement, to analyze carefully each volume of these reports." In the conclusion to Part I, entitled, General Comparative Analysis, the A. A. R. report makes this statement: "The apparent conclusion is that if careful appraisal of the economic soundness of projects now in existence or to be brought into existence were made, the uneconomic existing facilities would probably be eliminated by rail, by highway and by water and only useful facilities would be built as new projects. Everyone will probably agree that if sound economic considerations can be made to control additional transportation projects, half the battle will have been won. It has required a most extended discussion to reach such a simple conclusion. Nothing new has been brought forward. Every student of the subject has long known that the primary difficulty is to control additional transportation projects by sound economic considerations, rather than on a political basis. The primary difficulty is that no such economic consideration will be given. This, however, would have been apparent to the writers of this lengthy report if one-half the attention they have devoted to the activities of certain people connected with financing of the railroads more than half a century ago had been given to the pressure groups for new waterways and the nation-wide lobby for more extensive highway expenditures and airway expenditures. There is our real difficulty and there our real difficulty remains."

Women Employees On Soviet Railways

According to the Railway Gazette of London, in discussing women on Soviet railways, "thousands of women are working in the railway work shops as mechanics, fitters and turners." While the outside world does not seem to know much about what is going on in the Soviet today, it seems remarkable that women should be used to so great an extent on tasks that are ordinarily considered entirely within the province of men, at least so far as this country is concerned. Another statement that makes one wonder what is going on in the Soviet is that while three years ago there was only one woman engine driver on the Soviet railways, today there are 56 women engine drivers and 2,900 assistant engine drivers. This is in addition to a large number of women employed as motormen of electric trains. In all, it is estimated that more than half a million women are now employed on the railways of the Soviet Union.

"Trust Buster" Arnold After the A.A.R.

The Department of Justice filed a suit against the Association of American Railroads, its members and officers, charging that the railroads had violated the Sherman Act by refusing to enter into through routes and joint rates with motor carriers. It was alleged that this was accomplished by the passage of certain resolutions by the board of directors of the A.A.R. and agreement thereto by the member roads, thus constituting a conspiracy in restraint of trade. The railroads asked for a dismissal of the charge, because of the rescinding of the resolutions in question. Justice Jennings Bailey of the District Court of the United States for the District of Columbia has refused to dismiss the suit and so the railroads are required to answer the original complaint, after which it will go to trial.

What About Rule G And Public Safety?

A Pennsylvania railroad engineer was discharged for violating Rule G. Members of his own crew just prior to starting on their run had reported that he was not in fit condition to operate his train. He was examined by a competent physician, who stated in writing that the engineer was "absolutely unfit to handle an engine, due to the effects of alcohol." According to the railroad, this was not the man's first offense on this and other counts. He had been dismissed in 1935 for being intoxicated, but had been reinstated with the understanding that any further serious infraction of the rules would not be tolerated. He was again dismissed in 1937, but was reinstated on his own promise that any future failure to observe the rules "will be sufficient cause for my being immediately dropped from the service." In spite of this, the First Division of the National Railroad Adjustment Board rendered a decision on November 12, 1940, which restores full seniority rights and back pay to the time that he was dismissed in February, 1939. The board deadlocked on the case and a referee was called in. Apparently the decision was made on a technicality and the man who tried to operate an engine while intoxicated, instead of getting disciplined, got an award. How about the public and its safety? Or the other employees, whose lives are placed in jeopardy by gross infraction of Rule G?

Corn As Railroad Fuel

Argentina has a great surplus of corn. To protect the farmers the government purchased it, paying almost $12 a ton. As there were no markets available for the surplus, it was faced with a serious problem of how to dispose of it; the suggestion was made that the unshelled corn might be used as fuel for the railroads and public utilities. Experiments were made which showed that the unshelled corn, at less than $5 per metric ton, could be used for fuel as cheaply as coal, wood or fuel oil. The Argentine Ministry of Agriculture has therefore authorized the sale of the government-purchased corn for such purposes.

The British Carry On

London may be receiving a terrible "strafing," but it does not seem to interfere to any great extent with our British contemporary, the Railway Gazette of London. Of almost the same size as in normal times and very well printed, its numbers reach this country regularly and with comparatively little delay. The only sign of inconvenience, if it may be called such, is the notation on the masthead directed to "Callers and Telephoners." It states that, "Commencing Monday, November 11, and continuing until further notice, the office hours are Mondays to Fridays—9:30 a. m. to 3:45 p. m. The office will be closed on Saturdays." True, as one leaves over the publication week by week, references are made to the special problems under which the British railways are operating. Such articles, however, are not very numerous and are largely restricted to a section in the news department of the paper, entitled, Transport Services and the War. This section, including the November 15 number, has been running for 64 weeks. On the other hand, "The Scrap Heap," with its odds and ends and humor, still continues to be a feature of the paper. That it can joke, even under war conditions, may be seen from the following quotation, which is an extract from a letter which first appeared in the London Times. "A Swiss friend of ours lately returned to Basle from Hamburg, and had to change trains 52 times owing to the activities of the R. A. F. His only comment was that he wished it had been 70."

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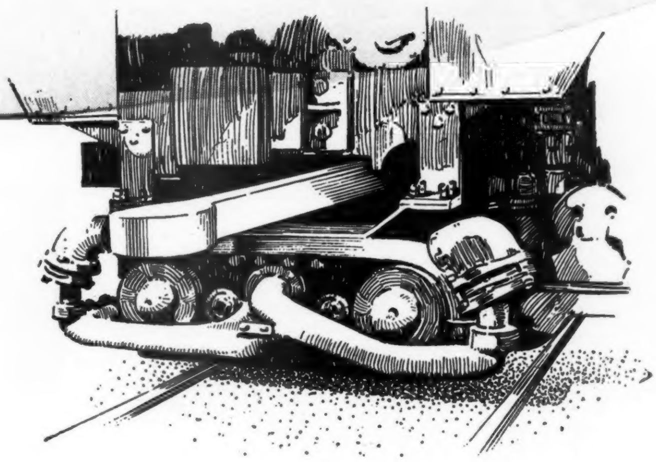
YOU CAN GET THE SAME WORK

at the Drawbar



with either

4,320 lb. COAL AN HOUR

or

5,000 lb. COAL AN HOUR

The smaller fuel consumption represents the performance of a locomotive equipped with an Elesco feed water heater.

This is an example of what reclaiming waste heat from exhaust steam through an Elesco feed water heater amounts to in fuel for the same work at the drawbar. In this case, the Elesco feed water heater reclaims 5,600,000 B.t.u. from the exhaust steam, replacing that amount of heat formerly generated with fuel in the firebox.

On any locomotive Elesco feed water heaters provide substantial fuel savings, water savings, and increased sustained boiler capacity through the reclamation of heat . . . utilizing otherwise wasted heat from the exhaust steam for preheating the boiler feed water.

You can cut your locomotive operating costs by applying Elesco feed water heaters. Write today for descriptive literature.

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NEWS

A. S. M. E. Honors Superheater Engineer

Carl A. W. Brandt, chief engineer of the Superheater Company, New York, was presented the Melville Medal "for original engineering work" by the American Society of Mechanical Engineers at its annual dinner and honors night on December 4 in New York. Mr. Brandt received the award for his paper entitled "The Locomotive Boiler."

The engineer so honored was born in Stockholm, Sweden, in 1881; studied mechanical engineering there and obtained his early experience with the Swedish Government Railways and the Sweden Atlas Locomotive Works. In 1902 he went with the New York Central and became mechanical engineer and master mechanic of the Big Four in 1910. Mr. Brandt joined the Superheater Company as its chief engineer in 1916. He continues in this position at present in charge of the development and design of locomotive equipment, including superheaters and feedwater heaters, in addition to similar apparatus for stationary power plants.

During the dinner five honorary memberships in the society were awarded. Recipients included James A. Seymour of Auburn, N. Y., inventor and developer of the McIntosh & Seymour engine, as well as numerous other inventions in the application of directly connected high-speed engines to electric generation. Mr. Seymour, in 1886, co-founded McIntosh, Seymour & Co., steam engine manufacturers, which concern later became manufacturers of Diesel engines and is now a subsidiary of the American Locomotive Company. Mr. Seymour retired from active business in 1922.

Equipment Purchasing and Modernization Program

Denver & Rio Grande Western.—The D. & R. G. W. has asked the Interstate Commerce Commission for authority to assume liability for $1,260,000 of serial equipment trust certificates, maturing in 10 equal annual installments of $126,000 on February 1, in each of the years from 1942 to 1951, inclusive. The proceeds of the issue will be used as part payment for equipment costing a total of $1,698,110 and consisting of 500 50-ton, 40½ ft. box cars.

Great Northern.—The Great Northern will soon begin the conversion of 15 steam locomotives at its shops at Superior, Wis., and Hillyard, Wash., at an approximate cost of $1,500,000. Conversion plans provide for almost complete rebuilding of the power units. When work is completed the locomotives will be assigned to freight service on the Kalispell division in the mountainous section of Montana.

Louisville & Nashville—The L. & N. has asked the Interstate Commerce Commission for authority to assume liability for $6,770,000 of equipment trust certificates, maturing in equal annual installments of $677,000 on December 15 of each of the years from 1941 to 1950, inclusive. The proceeds will constitute part of the purchase price of the freight-car equipment, costing a total of $7,527,271, shown in the table of orders which begins on this page.

Union Pacific.—The U. P. is contemplating construction in company shops of 100, 200 or 300 50-ft. lightweight automobile cars of 50 tons' capacity.

The "John Bull" Lives Off the Country-Side

Employees of the Long Island are authority for a tale of unorthodox foraging for locomotive fuel. It seems that in removing the Pennsylvania's replica of the "John Bull" locomotive (1831) from the late New York World's Fair, where it appeared in "Railroads on Parade," it was decided to run it under its own power over the busy tracks of the Long Island to the Morris Park shops, where it was to be prepared for shipment to Chicago to appear in a forthcoming celebration in connection with the installation of the big "S-1" locomotive in regular service. The antique unit took some 4½ hours for the run of approximately eight miles and reached its destination at 4:30 p. m., just before the rush of outbound commuters' trains began.

First trouble was encountered at Forest Hills—right on the busy multiple-track main—when the fire "died." Wood commandeered from a nearby grocery store put life into her again. Then several miles farther the fire languished again and the employees in charge, anxious about the impending "rush hour," ransacked a dairy plant along the line for old boxes, which, we learn, saved the day.

V. R. Hawthorne Honored at St. Louis

At the dinner and meeting of the Car Department Association of St. Louis, held Tuesday evening, November 19, at the Hotel De Soto, St. Louis, Mo., V. R. Hawthorne, secretary, Association of American Railroads, Mechanical Division, was the guest of honor and made the principal address.

At the conclusion of Mr. Hawthorne's address, F. E. Cheshire, president of the Car Department Association of St. Louis and general car inspector, Missouri Pacific, complimented the author on his effective work in co-ordinating the activities of the various A. A. R. committees, especially those having to do with the more efficient interchange of railway freight equipment. In the name of the association, Mr. Cheshire presented Mr. Hawthorne with a bronze plaque inscribed "Awarded to V. R. Hawthorne, November 19, 1940, in recognition of his incomparable contribution to the mechanics of railroad transportation, a patient counsellor, a gracious gentleman. Car Department Association of St. Louis, Mo."

Plaque presented to V. R. Hawthorne on November 19 by the Car Department Association of St. Louis

Orders and Inquiries for New Equipment Placed Since the Closing of the December Issue

Locomotive Orders

Road	No. of Locos.	Type of Locos.	Builder
Aluminum Co. of America	1	350-hp. Diesel-elec.	General Elec. Co.
Arkansas Valley	2	350-hp. Diesel-elec.	General Elec. Co.
Atchison, Topeka & Santa Fe	1	1,000-hp. Diesel-elec.	Baldwin Loco. Works
Bessemer & Lake Erie	5[1]	2-10-4 Texas-type	Baldwin Loco. Works
	2[1]	0-8-0	American Loco. Co.
Boston & Maine	4	380-hp. Diesel-elec.	General Elec. Co.
	2	4-8-2	Baldwin Loco. Works
E. I. duPont de Nemours Co.	1	350-hp. Diesel-elec.	General Elec. Co.
	2[2]	300-hp. Diesel-elec.	....
	2[3]	300-hp. Diesel-elec.	....
East Erie Commercial	1	350-hp. Diesel-elec.	General Elec. Co.
Elgin, Joliet & Eastern	7	600-hp. Diesel-elec.	Electro-Motive Corp.
	2	1,000-hp. Diesel-elec.	
	3	600-hp. Diesel-elec.	American Loco. Co.
	2	1,000-hp. Diesel-elec.	
	1	1,000-hp. Diesel-elec.	Baldwin Loco. Works
Great Northern	2	2,700-hp. Diesel-elec.	Electro-Motive Corp.
Gulf, Mobile & Ohio	4	660-hp. Diesel-elec.	American Loco. Co.
Jones & Laughlin Steel Corp.	1	Freight	American Loco. Co.
Kewanee, Green Bay & Western	1	660-hp. Diesel-elec.	American Loco. Co.
Monongahela Connecting	2	750-hp. Diesel-elec.	General Elec. Co.
Mississippi Export	1[4]	380-hp. Diesel-elec.	General Elec. Co.

Orders and Inquiries for New Equipment—Continued

New York, New Haven & Hartford	1	380-hp. Diesel-elec.	General Elec. Co.
Norfolk & Western	5	4-8-4 Pass.	Company Shops
Northeast Oklahoma	1	500-hp. Diesel-elec.	General Elec. Co.
Northern Pacific	8	4-8-4	Baldwin Loco. Works
	6	4-6-6-4	American Loco. Co.
Pittsburgh Limestone Corp. (U. S. Steel subsidiary)	5	320-hp. Diesel-elec.	General Elec. Co.
Reading	4	600-hp. Diesel-elec.	Electro-Motive Corp.
	1	1,000-hp. Diesel-elec.	
	3	600-hp. Diesel-elec.	Baldwin Loco. Works
	3	1,000-hp. Diesel-elec.	
	3	660-hp. Diesel-elec.	American Loco. Co.
Republic Steel Corp.	2[3]	340-hp. Diesel-mech.	Fate-Roat-Heath Co.
	1	340-hp. Diesel-mech.	
Semmett-Solvay Co.	2	500-hp. Diesel-elec.	General Elec. Co.
St. Louis-San Francisco	3[5]	4-8-4 Pass.	Company Shops
	5[6]	4-8-2 Freight	
Southern	2	4,000-hp. Diesel-elec.	Electro-Motive Corp.
	2	4,000-hp. Diesel-elec.	American Loco. Co.
United States Army	2	350-hp. Diesel-elec.	General Elec. Co.
	1	300-hp. Diesel-elec.	
	2[2]	Diesel-elec.	
Wabash	1	600-hp. Diesel-elec.	Electro-Motive Corp.
Youngstown Sheet & Tube Co.	1	Steam	Heiseler Loco. Works

Locomotive Inquiries

Panama Railroad[7]	3	Steam	....
Union Pacific	5, 10 or 15	Freight	....
United States Navy Dept.	1	50-ton Diesel-elec.	....

Freight-Car Orders

Road	No. of Cars	Type of Cars	Builder
Aliquippa & Southern	25	90-ton gondola	Company Shops
Berwind-White Coal Mining Co.	50	50-ton hopper	Company Shops
Bessemer & Lake Erie	650[1]	90-ton hopper	Pull-Std. Car Mfg. Co.
	300[1]	50-ton box	Greenville Steel Car Co.
	50[1]	50-ton flat	Magor Car Corp.
	100[8]	Box	American Car & Fdry. Co.
	20[8]	Caboose	Greenville Steel Car Co.
Colorado & Wyoming	15	70-ton gondola	Pull-Std. Car Mfg. Co.
Cudahy Car Lines	50	40-ton refrigerator	Company Shops
Detroit, Toledo & Ironton	300	50-ton gondola	Greenville Steel Car Co.
Erie	50	70-ton flat	Greenville Steel Car Co.
Ethyl Gasoline Corp.	18	50-ton tank	American Car & Fdry. Co.
	6	40-ton tank	
Illinois Terminal	250	Box	American Car & Fdry. Co.
International Nickel Co. of Canada	15	70-ton ore	National Steel Car Co.
Louisville & Nashville[9]	50	70-ton gondola	Pull.-Std. Car Mfg. Co.
	1,400	50-ton hopper	American Car & Fdry. Co.
	1,600	50-ton hopper	Pull-Std. Car Mfg. Co.
	50	70-ton gondola	
	100	Box	
Ministry of Transp. and Public Works, Brazil	150	30-ton flat	Pull-Std. Car Mfg. Export Co.
	150	30-ton box	
	150	30-ton gondola	American Car & Fdry. Export Co.
	8	30-ton tank	
	150	Sets of trucks	
New York Central	200	70-ton flat	Despatch Shops, Inc.
Norfolk & Western	30	70-ton hopper	Company Shops
Northern Pacific	30[4]	70-ton hopper	Gen. Amer. Transp. Corp.
Norfolk Southern	250	40-ton box	Magor Car Corp.
	50	50-ton gondola	American Car & Fdry. Co.
	50	50-ton hopper	Virginia Bridge Co.
Panama Railroad	35	50-ton flat	Magor Car Corp.
	30	50-ton box	
	15	Gondola	
Pittsburgh & West Virginia	20[4]	Caboose	Company Shops
St. Louis-San Francisco	500	40-ton box	Company Shops
	100[10]	Coal	
	9[10]	Box	
	1[10]	Automobile	
	10[10]	Caboose	
Solvay Process Co.	5	70-ton tank	American Car & Fdry. Co.
	4	40-ton tank	
Southern Pacific	125	70-ton flat	Southern Pacific Equip. Co.
	15	70-ton gondola	
	50	Caboose	
Tennessee Central	100	40-ton box	Pull.-Std. Car Mfg. Co.
Union Tank Car Co.	150[11]	50-ton tank	Company Shops
Wabash Car & Equipment Co. of St. Louis	5	70-ton hopper	American Car & Fdry. Co.

Freight-Car Inquiries

Chicago, Indianapolis & Louisville	100	50-ton box	....
	100	50-ton flat	....
Elgin, Joliet & Eastern	500	50-ton box	....
Pittsburgh & Lake Erie	1,000	Box	....

Passenger-Car Orders

Road	No. of Cars	Type of Cars	Builder
Atlanta & West Point Western Railway of Alabama	2	Baggage-express	American Car & Fdry. Co.
Canadian Pacific	25	Passenger-train	Company Shops
	10	Baggage and express	Canadian Car & Foundry Co.
Pacific Electric	30[4]	Coaches	Pull-Std. Car Mfg. Co.

[1] Has awarded contracts for the construction amounting to approximately $5,000,000. See December issue.
[2] Delivered in November, 1940.
[3] Delivered earlier this year.
[4] Delivery received.
[5] For delivery March, 1941.
[6] For delivery June, 1941.
[7] Bids will be received to December 30 by the general purchasing officer, the Panama Canal, Washington, D. C.
[8] Contracts for this equipment amounting to approximately $475,000.
[9] Estimated cost of this equipment is $7,527,271.
[10] Constructed earlier this year.
[11] For completion in March, 1941.

Painted Wheels and Car Retarders

The Association of American Railroads, Mechanical division, reports in a circular letter from Secretary V. R. Hawthorne, dated December 5, that some difficulty is being experienced in controlling cars (especially when loaded) through car retarder devices in cases where the wheels have been newly painted. The Arbitration Committee has ruled that resulting damage to cars, where no failure of the retarder itself, or its method of operation, is involved, shall be the responsibility of the car owner, provided a Rule 44 combination is not reached. The committee suggests that member roads make arrangements to protect both the outside and inside surfaces of wheel rims by metal shields or other device while trucks are being painted.

Retirement Board Names Employment Officers

Announcement of the appointment of nine employment officers to administer the recently-established employment service was made on December 2 by the Railroad Retirement Board. The employment service, it is pointed out, is being operated in connection with the railroad unemployment insurance system, and makes possible the collection in each regional office of the Board of a complete file of unemployed railroaders in the region. Names and qualifications of the idle railroad workers are referred on request to railroad employers for interview and placement.

Those named to the new positions and their regions include: Peter S. Hogan, New York region; John J. Finnerty, Cleveland; Horace L. Carter, Chicago; James H. Williams, Atlanta; John R. Duck, Minneapolis; Otto Kirkes, Kansas City; Sam J. Williams, Dallas; Earl F. Rentfrow, Denver; and Harold O. Clark, San Francisco. Most of the appointees have had railroad experience, and all have been associated with the Railroad Retirement Board.

Equipment Depreciation Orders

Equipment depreciation rates for 11 railroads, including the Louisville & Nashville and the Kansas City Southern, have been prescribed by the Interstate Commerce Commission in a new series of suborders and modifications of previous suborders in No. 15100, Depreciation Charges of Steam Railroad Companies. The composite percentages for all equipment, which are not prescribed rates, range from 3.01 per cent for the L. & N. to 9.41 per cent for the Angelina & Neches River.

Prescribed rates for the L. & N. are as follows: Steam locomotives, 2.83 per cent; other locomotives, 3.92 per cent; freight-train cars, 3.08 per cent; passenger-train cars, 2.62 per cent; work equipment, 3.92 per cent; miscellaneous equipment, 13.03 per cent. The K. C. S. composite percentage is 3.07, derived from prescribed rates as follows: Steam locomotives, 3.18 per cent; other locomotives, 3.92 per cent; freight-train cars, 2.92 per cent; passenger-train cars, 3.05 per cent; work equipment, 3.03 per cent; miscellaneous equipment, 13.35 per cent.

(Turn to second left-hand page)

The

Controlling Switching Movements

In yard switching, the Diesel-electric locomotive gives very good service. My observations cover all classes of yard work: heavy lead switching, industry work, and transfer work.

The yardmen and enginemen soon become familiar with the handling of the Diesel locomotive. We all know the yardmen working with steam power, switch cars by the exhaust of the engine. The Diesel locomotive changes this, and the yardmen have to watch the cars, however, the proper handling is soon learned.

The yard engineman can save at least 20 per cent in the stopping distance, if the yardmen are out far enough from the side of the cars to be observed, so the engineman can use one hand on the throttle and the other hand on the brake valve. If the engineman is only using one hand to handle first the throttle and then the brake valve, they will move two or three car lengths farther before the cars separate. The Diesel locomotives drift as good or better than the cars. This is not the case with a steam locomotive, for when it is shut off the pistons act as a brake and will pull the slack out before the brakes are set on the steam locomotive.

Diesel engines come up to their maximum speed within a few seconds and there is available full tractive force through the electrical system. Quick acceleration results. Standby losses are small.

Yardmen favor the Diesel locomotive because there is no exhaust steam or smoke blowing down on the leads to interfere with their signals, nor ice forming on the leads in the winter from the injector overflow. The engine crew's visibility is very good, and this is a very important factor in a busy terminal where a large number of trains, engines, and signals must be observed.

Yardmasters can place the Diesel locomotives on any job. There is no need to think of the wheel arrangement, or the road number when the smaller old industry tracks have to be pulled or a car spotted. The Diesel will go any place a freight car will clear. The Diesel locomotive will also make transfers, making it unnecessary for the yardmaster to wait until a certain type locomotive returns from another job to make the delivery. It will go out on a lead and give very good service. The Diesel locomotive is ideal yard power.

From Leo W. Powell's paper "The Road Foreman and the Diesel-Electric Locomotive" presented at the fourth annual meeting of the Railway Fuel and Traveling Engineers' Association.

Mediation Board Decision on Lehigh Valley

The National Mediation Board has decided that certain employees who have worked for the Lehigh Valley during the period from January 1, 1940, to September 16, 1940, although they may now be on furloughs, are entitled to vote in an election to determine which of two unions shall represent a particular class of employees in collective bargaining.

The decision of the board on December 8 reveals that its services were invoked by the Railway Employees' Department, American Federation of Labor, to settle a dispute as to whether the International Brotherhood of Blacksmiths, Drop Forgers and Helpers, the International Brotherhood of Boilermakers, Iron Ship Builders and Helpers of America and the Sheet Metal Workers' International Association, operating through the Railway Employees' Department, A. F. of L., may represent, respectively, the blacksmiths, boilermakers and sheet metal workers and the helpers and apprentices of the foregoing, employed by the Lehigh Valley.

Mediator James P. Kiernan found, after investigation, that the employees involved in the dispute are at present represented by the Association of Maintenance of Equipment Employees of the Lehigh Valley.

The board goes on to point out that it is the position of the Association that the list of eligible voters should contain only the names of employees who were on the payroll of the carrier as of the last of the month of September, 1940, including men now in service, those on authorized leaves of absence, those on sick leave, those on the injured list, and those who had been in the services of the company on the above date but had left to enlist in the United States Army or Navy. The Railway Employees' Department contends on the other hand that the list of eligible voters should contain those names which appeared on the payroll for the last period of September, 1940, including those on sick leave, or other authorized leave of absence and those who have worked for the carrier during the period from January 1, 1940, to September 16, 1940, and who were then on furlough on account of reductions in force.

The Board decided to use the January 1, 1940, date because of the fact that in another election involving, among others, these same employees, it had used this date. After the election had got under way the Association protested this action and asked for the public hearing held on November 25 before Board Member D. J. Lewis.

After testimony of both the employees and J. P. Laux, superintendent of motive power of the Lehigh Valley, to the effect that it was the established policy of the carrier to recall furloughed employees to service when forces are increased and that furloughed employees retain their seniority rights, the Board decided to abide by its previous finding and permit the election to be held at some future date. The votes already cast will be allowed in the new election.

Supply Trade Notes

Gale E. Spain has been appointed general sales manager of the Caterpillar Tractor Company.

◆

Jay M. Reibel, formerly with McCann-Erickson, has been appointed advertising manager of the American Car and Foundry Company.

◆

Shirley, Olcott & Nichols have been appointed sales representatives for government work by the Whiting Corporation, Harvey, Ill. Offices are at 202 Mills Building, Washington, D. C.

◆

P. C. Cady has been appointed district sales representative of the Union Railway Equipment Company, Chicago, with headquarters at 30 Church street, New York.

◆

Paul Keller has been appointed Cleveland district manager in charge of the sale of Aristoloy alloy steels by the Copperweld Steel Company with offices in 415 Swetland Building, Cleveland, Ohio. Mr. Keller was previously connected with the Mid-States Steel & Wire Co. and the Bethlehem Steel Company.

◆

The A. M. Byers Company, Pittsburgh, Pa. will soon enlarge its activies to include the production of alloy steels, including stainless. An addition will be built to the company's Ambridge plant and will be used as a melt shop for new electric furnace equipment. Other existing basic production equipment for heating and rolling alloys will be used. The production of billets and bars for alloy-steel fabricators will begin in four to six months.

◆

James F. Fitzgerald has been appointed special representative on railway welding requirements by the C. D. Hicks Company of St. Louis, Mo., which company has been designated sales agent to railways operating in the St. Louis area on Universal arc and spot welders, accessories, rods and electrodes manufactured and for sale by the Universal Power Corporation of Cleveland, Ohio.

◆

Alexander D. Bruce, vice-president and secretary of the Vapor Car Heating Company, Inc., Chicago, has been elected executive vice-president, and Otis A. Rosboro, a director, has been elected secretary. Mr. Bruce was born in Guelph, Canada, in 1887. His early employment was with a large carriage manufacturing plant and with the Standard Fitting & Valve Company in Canada. In 1909 he entered the employ of the Chicago Car Heating Company as storekeeper, and was successively purchasing agent and later Canadian manager. In 1917, upon the organization of the Vapor Car Heating Company, Inc., Mr. Bruce was elected secretary. In 1926, he was elected a director and vice-president and secretary of the Vapor Car Heating Company.

Alexander D. Bruce

◆

A. B. Morey, treasurer of the Gisholt Machine Company, Madison, Wis., has been elected vice-president and C. K. Swafford, general superintendent, has been elected a director.

◆

Foreman H. Craton has been appointed section head of the industrial haulage section of the General Electric Company's transportation department at Erie, Pa. Mr. Craton has been with General Electric since 1924, where he has spent about four years on the design of railway motors and control and also been identified with important work on the New York Central, Cleveland Union Terminal, and New York, New Haven & Hartford electrifications, and more recently on industrial and railway applications of Diesel-electric locomotives. He is a mechanical engineer, graduate of Syracuse University, a member of the American Institute of Electrical Engineers, past chairman of the Erie section, and has presented several papers before the national body.

◆

John M. Spangler, general sales manager of the National Carbon Company, has been appointed a vice-president of that company. Mr. Spangler, a graduate of Pennsylvania State College, joined the National Carbon Company in 1915. He became manager of the Railroad department five years later and in 1923 was made head of the Western Sales division with headquarters in Chicago. He became successively manager of the Eastern division with offices in New York, assistant general sales manager and in 1925 general sales manager.

(*Turn to second right-hand page*)

Obituary

Tom Moore, representative at Norfolk, Va. for the Gold Car Heating & Lighting Co., died on October 30.

◆

F. B. Hamerly, vice-president of the Independent Pneumatic Tool Company of Chicago, died November 27, of a heart attack, while inspecting the company's plant at Los Angeles, Calif.

◆

William S. Hamm, consulting engineer and a director of the Adams & Westlake Company, with headquarters in Elkhart, Ind., died in Denver, Colo., on December 1. He had been in the employ of the company 61 years.

◆

William Miller, chairman of the board of the Pyle-National Company, Chicago, died in that city on December 4, after a long illness. Mr. Miller was born at Hannibal, Mo., on July 3, 1867, and entered railway service as an apprentice in the Hannibal shops of the Chicago, Burlington & Quincy in June, 1882. From 1885 to 1889, he served as a journeyman on the Missouri-Kansas-Texas, the Wabash and the Denver & Rio Grande Western. In the latter year, he was appointed foreman of shops on the St. Louis San Francisco, and in 1900 became general foreman of the Colorado Midland. In 1904-05 he was appointed master mechanic of the Terminal Railroad Association and the Wiggins Ferry of St. Louis, and for two years was master mechanic and assistant superintendent of the Denver & Rio Grande Western. In 1907, Mr. Miller became superintendent of motive power of the Western Maryland and in 1908 resigned to become vice-president of the Adreon Manufacturing Company. Three years later he was elected president of the Monarch Pneumatic Tool Company and vice-president of the Standard Railway Equipment Company, from which position he resigned in 1913 to become vice-president of the Pyle-National Company. In 1914, he was elected senior vice-president, on August 2, 1934, president, and in March, 1938, chairman of the board.

William Miller

◆

H. C. Dreibuss, chief mechanical engineer of the Scullin Steel Company, died November 22, at St. Louis, Mo. Mr. Dreibuss had been with the Scullin Steel Company for 34 years.

Personal Mention

General

E. A. Shull, superintendent of motive power of the Wichita Falls & Southern, with headquarters at Wichita Falls, Tex., has retired. The position of superintendent of motive power has been abolished.

William Nelson, superintendent of machinery of the Kansas City Southern, has been appointed also superintendent of machinery of the Louisiana & Arkansas, with headquarters as before at Pittsburg, Kan.

E. M. Smith, superintendent of motive power of the Louisiana & Arkansas, has been appointed assistant superintendent of machinery of the Kansas City Southern and the Louisiana & Arkansas, with headquarters as before at Minden, La.

Master Mechanics Road Foreman

J. C. Benson, general foreman of the Atlantic Coast Line at Jacksonville, Fla., has been appointed master mechanic at Jacksonville.

H. J. Cosgrove, general enginehouse foreman on the Chicago, Rock Island & Pacific at Silvis, Ill., has been promoted to the position of master mechanic at Fairbury, Neb.

R. E. Deitrich, master mechanic of the Chicago, Rock Island & Pacific with headquarters at Dalhart, Tex., has been transferred to Armourdale, Kan., succeeding G. W. Heyman, who retired on December 1, after 34 years' service.

W. W. Lyons, general foreman on the Atchison, Topeka & Santa Fe at Belen, N. M., has been promoted to master mechanic of the Slaton division of the Panhandle & Santa Fe, with headquarters at Slaton, Tex., succeeding L. E. Fletcher, who retired on December 1.

T. P. Maroney, master mechanic of the Chicago, Rock Island & Pacific at Fairbury, Neb., has been transferred to Dalhart, Tex.

T. F. Lake has been appointed master mechanic of the Nevada Northern, with headquarters at East Ely, Nev., succeeding Charles Nesbitt, deceased.

Car Department

De Wyatt Akins, who has been appointed superintendent of the car department of the Texas & Pacific at Dallas, Tex., as noted in the October issue, was born on July 15, 1881, at Oxford, Miss. He attended the public schools and during 1899 entered the employ of the Illinois Central at Memphis, Tenn., where he served until 1904 as an apprentice, a car repairer, and an inspector. He then went to Shawnee, Okla., as a car repairer and inspector on the Choctaw, Oklahoma & Gulf. During 1906 he was a car inspector on the Union Railway at Memphis, Tenn., later being promoted to the position of foreman of the car department. In 1917 he became general car foreman on the Texas & Pacific at Fort Worth, Tex., and in 1932 was appointed general car department foreman at Marshall, Tex. In 1933 he became general car inspector, with jurisdiction over all T. & P. Lines. He was appointed superintendent of the car department at Dallas on August 1, 1940.

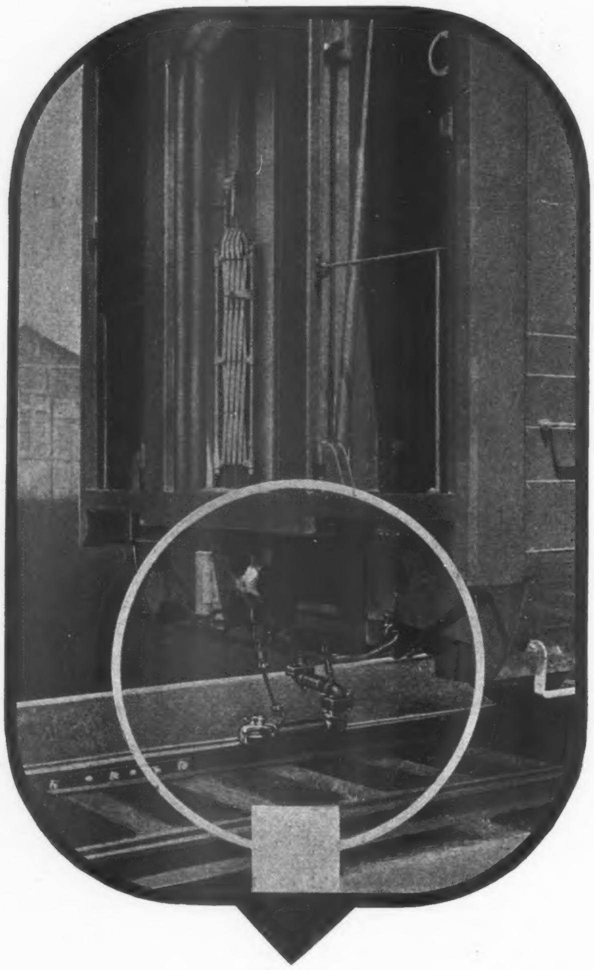
DeWyatt Akins

R. H. Marquart, superintendent of the freight-car department of the Illinois Terminal, has been transferred from Decatur, Ill., to St. Louis, Mo.

Obituary

Ora Clair Montgomery, whose death was noted in the December issue, was born on March 29, 1884, at Scribner, Neb., and entered the service of the New York Central in June, 1916, as a tester in the engineering department. He was appointed a special engineer the following year and in May, 1918, was given a leave of absence to enter the Army, in which he was commissioned a first lieutenant, United States Engineers. In January, 1919, he returned to railroad service as a computer and was appointed an engineer in the power department the following month. In July, 1921, he was appointed special staff engineer, power department, electric division, and in May, 1926, became assistant superintendent of power.

Type Ft-1



Type Ft-2

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